

Housing *news*



NEWSLETTER OF THE HOUSING RESEARCH CENTRE
UNIVERSITI PUTRA MALAYSIA

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Message from The Honourable Minister of Housing and Local Government

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My heartiest congratulations to the Housing Research Centre (HRC), University Putra Malaysia on the publication of the first edition of the 'Housing Newsletter'. I am indeed very happy to learn that the HRC has undertaken the task of disseminating information on current research developments in the housing and construction industry to policy makers, builders, developers and research institutions through this quarterly Newsletter.

Provision of affordable, quality housing to the people has always been one of the main concerns of the government. In the context of the present economic situation, it is necessary that researchers and professionals in the housing and construction industry come up with ideas and technology on alternative methods of construction including developing indigenous industrialised

building systems that can fulfill the demands of the people for houses that are built on time, at reasonable costs and with acceptable quality.

I am confident that through this Newsletter, the knowledge and expertise of researchers, professionals and builders can be brought forth to further the advancement of building systems in this country to meet the housing needs of the people.

I wish the Housing Research Centre, UPM and the Housing Newsletter success in this endeavour.

Thank you

DATU' DR. TING CHEW PEI
Minister of Housing and Local
Government MALAYSIA

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Message from the Director

It gives me immense pleasure to contribute my first message to the world of Housing through this first edition of the 'Housing Newsletter' published quarterly by the Housing Research Centre (HRC). Being the Director of the HRC, I feel proud that the HRC is striving to achieve its ambitious vision "to provide affordable quality housing for the global market". In elevating the HRC as one of the world's best centres for Housing, the HRC is committed to disseminate Housing related R & D achievements not only emanating from work at HRC or in Malaysia but also from around the world. Housing News shall fulfill the needs of academicians, researchers, builders, contractors and government agencies seeking latest information on housing and related issues.

At this juncture, I am obliged to promote the need for a Housing Research Centre in Malaysia. It is commonly accepted by developers, architects, engineers and government agencies as well as house owners that Malaysia has been facing a shortage of affordable and quality houses. To meet this demand, most developers rely on foreign based building systems, which unfortunately are not designed to cater for the needs of the local environment. This calls for a fresh look at the housing sector in Malaysia; on its technological, environmental, safety and economical contribution to the beneficiaries. To this backdrop, the HRC was



established at the Faculty of Engineering, University Putra Malaysia in 1996. The HRC is exclusively devoted to conduct R & D on Housing, and is now established as a centre of excellence in all matters related to housing in Malaysia. The HRC is supported by a highly dedicated team of specialists from multidisciplinary areas concentrating on all aspects of Housing.

To date, the HRC has achieved some progress and accomplished a great deal of tasks over the past three years. It includes two major on-going R & D projects worth around RM 2 million; a number of consultancy projects in collaboration with industry partners; establishment of a housing information centre at its own premise; and a number of seminars, colloquia, and training programs on housing and development.

Some of the significant short-term target products of HRC include affordable quality house designs, industrialised building systems, and indigenous building materials. The HRC, in the future, aims to play the leadership role in R & D in Housing in Malaysia; coordinate efforts from industry players to achieve an integrated and cost-effective approach in housing development throughout the country, and act as a focal point for housing related information around the world. In trying to achieve our vision, I welcome moral and material support and cooperation from all players in the housing sector, including professionals, researchers, academics, developers, contractors, architects, and government agencies.

HOUSING NEWS
shall fulfill the needs of
academicians, researchers,
builders, contractors
and government
agencies seeking latest
information on housing
and related issues

— Prof. Ir. Abang Abdullah
Abang Ali
Director, HRC

Housing Research Centre

A Centre Of Excellence

Housing Research Centre, established in 1996 at the Faculty of Engineering, University Putra Malaysia as a Centre of Excellence to give fillip to R&D activities in Housing and Building sectors, is perceived as a single point reference on all housing related aspects both for academicians and professionals. The main objective of the Centre has been to develop indigenously affordable quality housing for local and global markets.

The HRC has a dedicated interdisciplinary team of fourteen personnel comprising structural engineers, architects, environmentalists, social scientists and information experts. It has its own premises with a separate study cum discussion unit and a newly opened Resource Centre. There are presently four Research Assistants engaged in its activities. In addition, there are separate sections looking after R&D, Business Development, Information & Corporate matters. Meetings and internal discussions are held almost weekly to monitor the progress of the on-going projects and to synergise the expertise from different groups.

Currently, HRC is engaged in two major R&D projects. The project on Industrialised Building Systems is sponsored by IRPA, under which a significant break-through in the form of an indigenous precast concrete sandwich panel building system, which is durable, affordable, indoor environment friendly and amenable to industrialisation is in the offing. Theoretical investigations have been



completed and this is being followed by scaled model and prototype testing of proposed panels for strength and robustness.

The project on mortarless interlocking concrete block system has been sponsored by the Department of Housing. An optimised shape of interlocking block with projections and recesses has been developed using highly sophisticated finite element method to ensure structural efficiency. The performance of the optimised block in prototype construction is under study.

Other important activities include modular co-ordination, high performance concrete, construction materials and development of model house designs for low cost housing

The main objective of the Centre has been to develop indigenously affordable quality housing for local and global markets

harmonious with local cultural desirables. Currently, Putra Model 191 (single storey terrace house), Putra Model 291 (two storey duplex house) and Putra Model 591 (five storey walk-up apartment) are ready for marketing and large scale adoption on a housing project.

The HRC has been fortunate in having developed quite early a close and confident relationship with building industry. Two conferences and one colloquium have so far been held providing forum for industry – research face-to-face dialogue. The Centre has been receiving contract research and consultancy proposals from some major builders to help them upgrade their products and for authentication and assessment. A major research facility, Selangor State – HRC Housing Research Station, has been proposed so that all assessment and development facilities are secured under one roof.

The Housing Research Centre is unique, as it is an embodiment of voluntarism, dedication and commitment from highly specialised staff. We, at the HRC, live upto the mantra of 'academic pursuit for a commerciable product'. We invite the builders and the professionals, the end users, the academicians and the researchers to take advantage of the vast expertise available at the centre for their individual needs. We welcome enquiries and industry – research linkages. Pay a visit and meet us.

– Prof. D N Trikha

*Selangor Darul Ehsan Chair in
Advanced Construction Technology*

HRC Team visits a housing project in Bidor

A team comprising experts and researchers from the HRC paid a visit to an IBS double storey terrace and shopping lot development being constructed at 1.5km south of Bidor town on 15th December, 1998. Baktian Sdn Bhd. undertaking the design, production and installation of the facility.



The system, termed O-Stable Panel System was indigenously developed by Mr. Khoo Tian, a Malaysian Architectural Engineer. The system comprises three major components: column, wall and floor panel. The advantage of this system is the elimination of usual difficulties in joining system at junctions. Panels are secured by provision of cross columns (RCC) at the vertical recess of both component and precast slab. The general features of the system include (i) cross ventilation for all rooms, (ii) a tall head room of height 13 ft, (iii) plasterless wall, (iv) strip footing foundation, (v) roof ventilation, (vi) fine architectural view, and (vii) the erection speed at the rate of 2 to 3 days/unit. Because of the superb finishing of the panel, no plastering is required before painting.

Colloquium on IBS



A Colloquium in Industrialised Building Systems, facilitating its introduction in Selangor State was held on November 16, 1998 in the Engineering Faculty of University Putra Malaysia, at the instance of the R & D Council of the Selangor State. Dato' Tang See Hang was the guest of honour to inaugurate the colloquium. Dato' Haji Satim Diman also graced the occasion. A total of 43 participants took part with 9 senior executives from leading firms of contractors and developers. There were representatives from JKR, Ministry of Housing, SIRIM, HAD, PKNS, academics from UPM, ITM, and UKM and the R & D Council of the state.

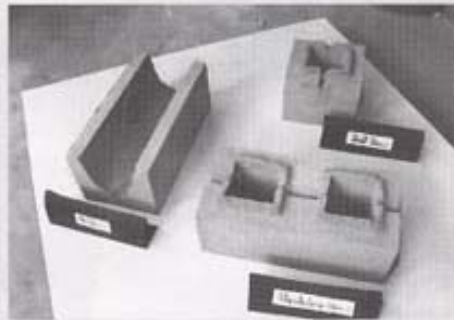
The highlights of the deliberations included a keynote address on 'use of industrialised building systems in housing development' by Prof. Abang Abdullah Abang Ali and a presentation by Prof. D.N. Trikha on 'R&D needs and infrastructure development for industrialised Building System'. Besides, a number of representatives from several companies presented their systems.

Two resolutions were moved from the floor reflecting the day's deliberations; Resolution 1: the colloquium reaches the consensus that a paradigm shift in approach to housing is imperative,

therefore, it strongly recommends that to achieve the targets for affordable quality housing, Industrialised Building Systems (IBS) must be accepted on a mass scale. It further recommends that to ensure flexibility in house construction and architectural design, these IBSs should be 'open' systems, Resolution 2: the four essential features of affordability, durability to achieve a life span of 50 to 70 years, quality of indoor environment compatible with national perceptions and strength and integrity against natural hazards are indispensable to developing a holistic approach to design housing units as targeted in the Seventh Malaysian Plan. It is noted that imported IBSs suffer from several incongruencies, which have led to non-acceptance of these systems over the conventional systems. The colloquium is of firm view that there is a need for indigenisation of the IBS not only for the national needs but also to develop exportable IBS for the global market. The colloquium therefore strongly recommends to the state government that in the absence of any similar institute in the state, a Selangor State – HRC Housing Research Station be established at the earliest to carry out much needed R & D to develop indigenous IBS, and for assessment of the imported IBS proposed to be introduced in the state.

The mobile interlocking block machine

A study has been carried out at the Structural Laboratory, University Technology Malaysia on the production techniques and the engineering properties of interlocking blockwork system intended for housing projects. The mobile interlocking block machine was used to manufacture the blocks.



hardened finished products were observed to be of acceptable tolerances in respect of the construction of the blocks.

The advantages of the mobile interlocking block machine are as follows: 1) it is light and mobile, it can easily be transferred to the construction sites thus saving on the transportation cost of the blocks and without the need for constructing a factory; 2) the estimated cost of the machine is less than RM 25000 therefore suitable for small contractors; 3) the frame, engine, vibrating table and the moulds can be dismantled for transportation and maintenance; 4) different moulds can be used to produce various sizes and shape of blocks; 5) the properties of the materials may also be altered to suit the strength requirements. The results have shown that the cost of construction for residential houses is competitive using the proposed interlocking blocks.

The mobile interlocking block machine consists of a bucket, hopper, mould, vibrating plate and guided mechanical devices. The machine runs on a diesel engine, which provides the power needed to raise the bucket and vibrate the mould. The mixture of cement, sand and water is fed into the bucket which then moves to the top in rotation to

pour the mixture into the hopper. The mortar is subsequently released into the mould and this machine achieves compaction by vibration combined with compression. A mechanical presser is used to press and level the top part of the block. Demoulding the finished products can be performed immediately by means of a guided mechanical device. The finished blocks (on the plywood base) can then be handled and placed in the curing racks.

The whole casting frame and the moulding system is designed to avoid transfer any transmission of jolts or vibrations from the machine to the freshly made blocks. With the right mix proportion, normal handling of the green blocks will not distort the blocks. The dimensions of the

— **Dr. Abd. Karim Mirasa**
Dr. Fadhadli Hj. Zakaria
Mr. Roslan Kolop
Mr. Mohamad Syazli Fathi
Universiti Teknologi Malaysia



IBS in Malaysia

BT Drywall panel

BT Drywall panel is a rigid and lightweight structural sandwich panel, laminated through bonding two or more facing materials/skins to a continuous series of honeycomb core composed of high-density kraft fibre paper. This structural sandwich construction was adopted by the American Society for Testing Materials (ASTM C274-53) and it was defined as "a laminar construction comprising a combination of alternating dissimilar simple and composite materials assembled and intimately fixed in relation to each other so as to use the properties of each to attain specific structural advantages for the whole assembly". In this respect the panel performs like the I-beam. The surface skin/facing acts as the flanges of an I-beam and the honeycomb core corresponds to the web.



System Housing in Malaysia

Does it satisfy customers' requirements?

Today, the high-end property sector has shrunk considerably leaving the developers with not many alternatives but the low-end market sector due to credit constraints. Based on the socio-economic impact on the housing development in the country, it is vital that the housing sub-sector does not halt due to a credit freeze since it directly supports over 140 linkage industries. With the forecast of a strong demand for low cost and low medium cost residential properties, the industry must be sustained to generate enough growth to avert massive unemployment and consequent social problems.

Under the present condition, the departure of foreign labour is clearly on the card. Hence, a greater emphasis needs to be placed on the creation of systems, process and approaches that are advanced and capable of propelling the housing industry which eventually lead to the followings:

- *Easier application of manufacturing processes to fabrication, reducing the worksite, improving quality (hence durability), health and safety efficiency.*
- *Reduction in the learning phase for the suppliers on each project improving the chance of correct*

products being supplied.

- *Further possibilities for the mechanisation of construction processes reducing site staff and improving efficiency.*
- *Reduction in labour resources with increased efficiency.*

The current system of delivery of houses is peculiar in the country where buyers make a commitment to purchase a house just based on plan, brief specification and model. This system of delivery of houses is good for a developing country since it enables big scale housing development to take place to meet the housing demand. The buyers are assisting in financing the development. However, in several instances, the buyers are subjected to the mercy of the developer who in turn depends on the contractor engaged to carryout the construction. The delivery process has a lot of inherent problems as the buyers have no idea on what they would be getting at the end of the day for a high commercial commitment. The quality of the end product is heavily dependent on the performance of all parties involved. In line with the government's policy to achieve a developed nation status by the year 2020, this type of housing policy has to be changed and 'Build and Sell' policy would be the ultimate goal that

the building industry has to work towards to. This would eliminate the problems as follows:

- *The risk of abandonment of the project*
- *Where buyers are forced to accept unsatisfactory workmanship*

However, as a short-term measure, the current delivery process would still be an acceptable system if the respective components/parties of the industry were more responsible. Following are some of the key areas that have to be addressed:

- *To improve the quality of skilled workers more training should be undertaken. The industry should target for less reliance on labour for the construction activities.*
- *Standardisation of building components.*

A number of research works has been done on the concept of modular coordination. However, modular coordination would never be implemented if there were no active participation from the manufacturing sector. If major components of the building could be standardised and modular coordinated, this would speed up the construction process and minimise defective works and reliance on highly skilled labour.

– **Abdul Majid Ramli**
Projass Langbuil Sdn. Bhd

CURRENT RESEARCH AT HOUSING RESEARCH CENTRE (HRC)

► Precast Concrete Sandwich Panels (PCSP)

The precast wall panel is one of the important building elements in precast concrete system, and it is mainly divided into two categories which are the load bearing and the non-load bearing wall panels. The Precast Concrete Sandwich Panel (PCSP) consists of two precast concrete layers or wythes separated by a layer of insulation. The two layers or wythes may be a standard shape, such as a flat slab, hollow core section, double tee or any architectural section produced for a single project, and it is connected by a series of concrete webs or metal connectors. PCSPs are structurally divided into 3 major categories which are: composite panels – the two wythes will act as one when the load is applied on to the panel by having a full shear transfer between both wythes; non-composite panels – the two wythes have been analysed, designed and manufactured to act independently; and semi-composite panels – the two wythes act together during stripping, shipping and erection, but act as non-composite panels for in-plane loads.

The industrialised building system is seen as an ideal solution in meeting the demands of the Seventh Malaysian Plan (1996-2000). In meeting this demand, foreign building systems have been used without much consideration or knowledge on their structural behaviour, stability, integrity, suitability and safety to the local environment. As such, a comprehensive testing of the system should be conducted to ensure that any building system should encompass the above criteria. To this backdrop, a group of researchers at HRC have been awarded an IRPA research grant to develop and design a commercially viable building system (using PCSP) for the local construction industry.

The research team includes: Prof. Ir. Abang Abdullah Abang Ali; Prof. D.N. Triidha; Dr. Abdul Aziz Abdul Samad; Dr. Mohd. Razali Abdul Kadir; Dr. Mohd. Saleh Jaafar; Dr. Mahgoub Osman Mahgoub; Dr. Waleed Abdul Malik Thanoon; Rahinah Ibrahim; Puan Sumarni Ismail; Hj. Ghazali Said; Mohd. Halim Osman; and Nayan Din. Currently, the team is supported by four full time research students. Until now, about 30 undergraduate projects under the supervision of the research members have been conducted on areas related to industrialised building system and PCSP.

The research is expected to come up with a commercially viable PCSP for the development of an industrialised building system in Malaysia and an indigenous building system which will meet the demands of the local market and environment.

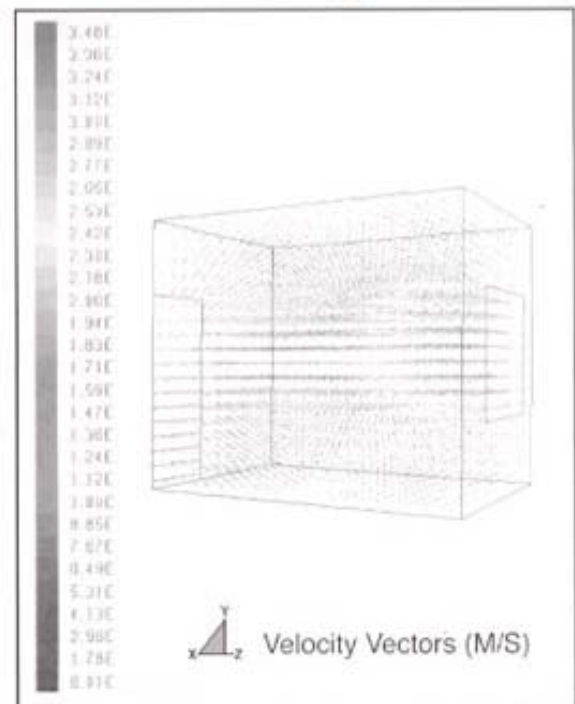
► Window Design For Low Cost Housing

Problems of overheated houses have been reported in the mass media extensively in Malaysia. A major reason is the insufficient air flow due to insufficient fenestrations (window, door). Research is going on at HRC to comprehensively study the optimum window size for various types of low cost houses built at UPM using a combination of site measurements and computational fluid dynamics. The trace-gas concentration decay technique has been used to measure ventilation rates for different types of rooms, under three different conditions i.e. completely sealed room, room with one window open and a room with both window and door open. The houses under study are single storey, double storey and walkup flats.

From the test results, the average air change for sealed rooms is found to be $0.5h^{-1}$, for a room having one window opening, it is $1.1h^{-1}$ and $1.5h^{-1}$ for a room with one window and door opening under external wind of $0.3 m/s$. These values are below the recommended ASHRAE air change value of $2h^{-1}$ for dwellings.

Results also indicate that the vertical height of the opening has a significant influence in reducing room temperatures. The optimum height /width ratio of the window is found to be 1.6 for all types of houses selected for the study. With this design, a temperature difference of $5^{\circ}C$ between the external and the internal can be achieved and air change of $2h^{-1}$.

The Research team is led by Dr. Nor Mariah Adam, a member of the HRC team.



HRC Vision & Mission

Vision

HRC endeavours to provide affordable quality housing for the global market.

Mission

- Coordinate R&D on all aspects of housing
- Conduct training on housing
- Promote university-industry partnership in housing
- Design socially and environmentally friendly townships
- Set-up database and information centre on housing

HRC Service

HRC offers to work closely with developers, government agencies and construction companies to help in:

- The development of model building systems for quality housing at affordable prices; thermal comfort and indoor environment friendly designs
- Theoretical investigations for assessment of strength and integrity of imported building systems
- Experimental validation of new innovative building systems/ components for strength and integrity, durability studies
- Fire safety studies
- Development of alternative building materials
- Constructability and labour saving

The HRC Family

- Prof. Ir. Abang Abdullah Abang Ali
- Prof. Dr. D. N. Trikha
- Ir. Dr. Mohd Razali Abd. Kadir
- Ir. Dr. Abdul Aziz Abdul Samad
- Ir. Dr. Mohd Saleh Jaafar
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- En. Baharudin Ab. Karim
- Pn. Farah Nora Aznieta Abdul Aziz
- Cik Suhaili Musa

World Engineering Congress and Exhibition '99

The World Engineering Congress, one of the remarkable international events of this year, is jointly organised by Universiti Putra Malaysia and the Institution of Engineers, Malaysia. The congress will be held in Sheraton Subang Hotel and Towers located in the prestigious township of Subang Jaya, Kuala Lumpur from 19th to 22nd July, 1999. Approximately, 1000 delegates all around the world are expected to attend the congress. About 500 technical papers, covering a wide spectrum of the engineering disciplines are expected to be presented. Of which 45 papers will cover all relevant issues of Industrialised Building Systems and Structural Engineering.

The congress consists of several parallel conferences covering the major disciplines and specialist areas in engineering including: Industrialised Building System and Structural Engineering, Aerospace Engineering, Biological and Agricultural Engineering, Chemical and Environmental Engineering, Civil Engineering, Computer System and Communication Engineering, Electrical and Electronics Engineering, Mechanical and Manufacturing Engineering, Process and Food Engineering, and Automation and Robotics.

The first day will start with keynote addresses in the morning and special lectures in the afternoon given by renowned personalities. The following day is when delegates will separate into parallel conferences according to their major disciplines and specialist areas. Each session will begin with invited lecture or theme lecture. On the third day, in the morning, separate parallel conferences will continue and end with a forum in the afternoon. An engineering exhibition and a poster session will also be held throughout the congress.

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