

# Housing news



NEWSLETTER OF THE HOUSING RESEARCH CENTRE  
UNIVERSITI PUTRA MALAYSIA

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The increased housing demand during the Seventh Malaysia Plan (1996 to 2000) has sought the use of industrialisation towards achieving the target of producing 600,000 houses for different user-groups. The shift towards industrialisation was prompted by the demand for quality while affordable for the public. This scenario causes a great concern to builders and developers in offering more quality products to the customers.

## New Building Technology

The key to technology development in building is constituted by the following factors: standardisation, prefabrication, modular coordination, and industrialisation. Standardisation is the compatibility of building components, which possess standard principal dimensions by the use of modular coordination. The technology transformation will, thus, enhance the use of industrialised building system to meet the demand for more quality houses. The use of building systems is usually more economical than the conventional construction system due to the following advantages:

- Standardisation of sizes and materials allows faster and more accurate production with less waste.
- More accurate scheduling can be obtained because of more predictable production.
- The use of unskilled or semi-skilled labour is possible by the simplicity and standardisation of the construction technique.
- With the use of standardisation of building components, the use of Information Technology (IT) in construction can further be enhanced. IT will speed up the networking

## Building Systems in Malaysia

between the consultants, architects, contractors and most importantly, the clients.

## Industrialised Building System

The industrialised building system has been introduced in Malaysia since the 60's by the use of precast concrete beam-column elements. Due to some criteria that were not suitable for local cultural habits, the technique did not take off as planned. However, since the implementation of the Seventh Malaysia Plan, the use of system building using load bearing precast elements through either wall panels or hollow blocks has been in vogue.

The increased influx of foreign building systems have persistent problems and that caused various local institutions to study and develop an indigenous building system for the local construction industry. This includes the development study on precast concrete sandwich panels and interlocking hollow blocks. Another important aspect of the building system is the concept of the Open Building System, which allows building components that will fit together geometrically and functionally for a wide variety of building design. The highlight of this technique is that it allows high interchangeability of components from various building system suppliers, which the foreign building system suppliers could not achieve yet.



However, the success of industrialised building system does not entirely depend on the hardware elements but requires a balanced combination of the software elements of the system. The software elements, for instance, include the land requirements, financing, certificate of fitness (CF), transfer of ownership, consumer rights and so on.

Ir. Dr. Abdul Aziz Abdul Samad  
HRC

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# HOUSE REFURBISHMENT - A new research frontier in the Malaysian construction industry

Refurbishment, in its many forms, such as modernisation, renovation and rehabilitation is potentially becoming an important sector in the Malaysian construction industry. There is a large stock of old buildings in Malaysia that are already functionally obsolete, i.e., they are no longer able to satisfy the requirements of weather exclusion, acoustic and thermal performance. Many buildings in the town areas have become dilapidated. The buildings in the run-down areas generate social problems, such as vandalism and graffiti.

Aikivuori (1996) conducted a study in Finland, which shows that buildings become functionally obsolete 29 years after being built. She also found that change of fashion or technology may make many buildings obsolete only after 17 years of use. In many developed countries refurbishment contributed to about half the total output in the construction industry. In the United Kingdom, for instance, housing refurbishment contributed to nearly three-quarters of the total housing construction output in 1998 (CCIS, 1998). Thus, it is fair to assume that many buildings built in the early 70s in this country will soon need to be refurbished.

Unfortunately, skill and knowledge in refurbishment in this country are still sparse. Refurbishment has been relatively ignored, with the focus of education, training and research mainly directed to new buildings. Quah (1986) however argued that refurbishment is generally considered more complex and uncertain. Estimating, organising and

executing the works demand techniques different from those of new-build that are more predictable and more capable of positive planning.

The uncertain variables in refurbishment projects need to be managed. The knowledge of managing refurbishment projects needs to be improved. These should provide the main impetus to conduct research on housing refurbishment in Malaysia.

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## **The rationale for improving the management of housing refurbishment projects**

Boyd and weaver (1994) observed that when the buildings to be refurbished are occupied during the design stage, a complete survey of structural work is difficult to undertake because of limited access to the building, which results in lack of complete drawings to guide the designer and builder in refurbishment work. Inadequacy of specifications from the architects makes it difficult for contractors to define the exact scope of work in advance. As a result, the planning and control of refurbishment works are difficult.

Quah (1992) found that regardless of project size, refurbishment tenders had a higher bid variance than

new-build tenders. The higher variability in tender bids reflects the inadequacy of specifications and unfamiliarity with the technical problems of refurbishment work.

During the construction stage, refurbishment projects face further complexity and uncertainty. With most refurbished buildings being occupied, there is pressure to shorten the construction cycle, which in turn creates a higher intensity of site activity. Refurbishment also consists of small work packages being carried out simultaneously and scattered throughout the building. This can lead to difficulty in allocating labour resources to achieve maximum productivity.

The complexity and uncertainty of refurbishment projects are often cited as one of the main reasons for the performance of the refurbishment projects being unsatisfactory. The BRE (1990) informs us that the problems in refurbishment projects are often underestimated and the final account frequently rises unacceptably beyond original estimates. Ismail (1997) found that more than 50% of refurbishment projects exceeded the tender cost.

## **The areas of housing refurbishment management that need improvement**

The Refurbishment Research Group of the Institut Teknologi MARA is formed to propagate research in the management of refurbishment. This group is led by Professor Dr. J. Torrance, formerly the Head of the Building Department, Faculty of the Built Environment, University College

# Thermal insulation of building materials

Insulating materials have acquired great economic importance since the energy crisis of 1970s because their usage in buildings results in large energy savings, particularly in regions with cold winters, such as the Northeast and Midwest of the USA. In most of Canada, Northern Europe and Northern Asia and similarly with the tropical climate countries, like Malaysia, the energy concern is related to as to how to minimise the solar heat gain in buildings which eventually has to be absorbed by the building's air conditioning system.

The temperature moderated by the fabric of the building, building envelope, is greatly enhanced by air gaps or insulating materials. The most effective thermal insulating materials are in fact materials that entrap air, or sometimes gas of very low thermal conductivity, where heat loss by convection is prevented by the entrapment.

Successful thermal insulating materials in current use are cork, lightweight fibre board, mineral wool (made by blowing air or steam through molten glass, molten rock, or molten blast-furnace slag), various expanded plastics such as polystyrene and various plastics applied as foam that subsequently set hard, such as rigid polyurethane foam.

The growing importance of energy conservation and the need to have reliable information about the insulating properties of building materials requires detailed specifications of the test methods. One of the established standards that addresses this technical issue is BS 874: Part 3: Section 3.2: 1990, Determining thermal insulating properties, using calibrated hot-box method.

## Principle

The basis for the method is the measurement, at equilibrium, of the heat flux through the test element and the corresponding temperature differences across it. The apparatus is shown schematically in Figure, consists of two principal items, a metering box and a cold box, between which the test element usually assembled in a support frame is placed.

Heat supplied to the metering box passes through the test element to the cold box, which is maintained at a constant low temperature. The heat flux through the test element is determined from the total power supplied to the metering box walls and the flanking loss to the cold box occurring around the perimeter of the specimen from prior calibration measurements using specimens of known properties.

When thermal equilibrium is achieved, i.e., when the temperature on each side of the test element and the heat flux through it are essentially constant, then the final measurement is taken.

The thermal transmittance,  $U(W/m^2.K)$  is calculated as follows:

$$U = f / A(T_{e_1} - T_{e_2})$$

Where:

$f$  is the heat flux through the metering area (W)

$A$  is the test area ( $m^2$ )

$T_{e_1}$  is the environmental temperature in the metering box ( $^{\circ}C$ )

$T_{e_2}$  is the environmental temperature in the cold box ( $^{\circ}C$ )

In terms of the building envelope, U-value is the critical factor in design consideration of building in order to achieve energy efficiency. The lower the U-value, the more effective is the insulation or building resistance to heat flow and therefore the greater the level of insulation provided. While the U-value is an important influence on the rate of heat loss and heat gain from a house or building the thermal comfort inside a house or building is

*continued on page 7*

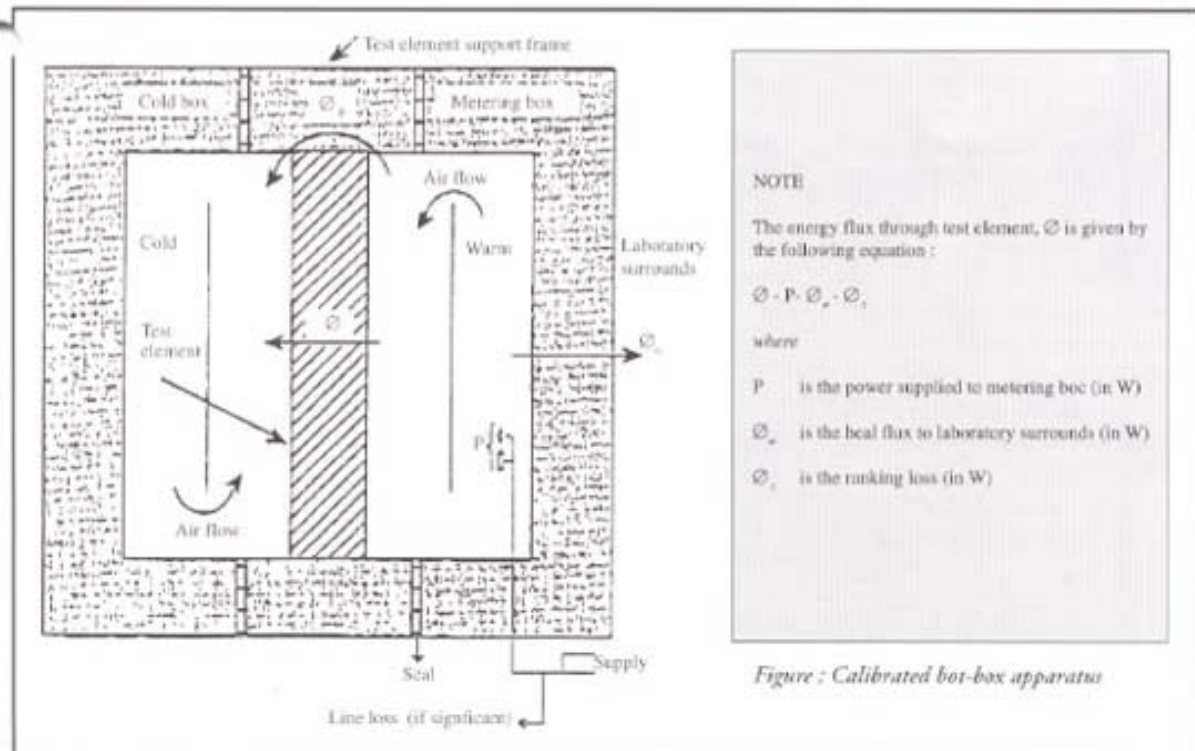


Figure : Calibrated hot-box apparatus

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## HOUSE REFURBISHMENT - A new research frontier in Malaysia construction industry

London, and has specialism in refurbishment. He has conducted and supervised many studies on refurbishment in the UK.

Refurbishment is a new research area in Malaysia. Statistics on the actual value of refurbishment work in Malaysia is not even available. Initially, the group is conducting a study on the demand for refurbishment work in Kuala Lumpur. A sample of the owners of public and private buildings in Kuala Lumpur will be surveyed. This study will investigate their future refurbishment plans, if any, for their buildings. This survey will enable the group to assess the demand for refurbishment work. In addition, the group will also investigate to what extent refurbishment could help satisfy the needs of housing. The impact of the move of the government administrative offices from Kuala Lumpur to Putr Jaya on the demand for refurbishment work will be included in this study. The group believes that many of the old offices could be converted into flats and will therefore need to be refurbished.

The main interest of the group however, is to improve the knowledge on managing refurbishment work. The group believes that there are not many construction managers in Malaysia specialising in refurbishment. Research on planning and control, health and safety, education and training, procurement systems and design process of refurbishment work are some areas to be researched.

Right now the group is involved in research on the health and safety of refurbishment work. Many refurbishment works involve partial demolition and stripping old building

## HRC initiates a study on wall panels in collaboration with the Speedwall Building System

Speedwall Building System Sdn Bhd, as part of its Immediate R&D Priority Tasks, is working with HRC to develop design criteria for the use of its panels as building components. The main objective of this study is to determine precisely the structural behaviour of the speedwall panels, their component leaves and the connections between components, under design axial and lateral loads. Tests shall be carried out till failure of the panels, so that failure mechanisms can be identified.

The investigation will provide the necessary structural data to suggest improvements/modifications in the existing system to build up to 5 storey. The project is intended to be completed in less than six months time.

fabrics. The workers involved in refurbishment works are exposed to many dangers, such as falling objects, fumes and dust. The findings from this research will help construction industry to reduce accident rates and improve the morale of the construction workers involved in refurbishment works.

### Conclusion

The large stock of old buildings change in fashion and technology will create demands for housing refurbishment work. Skills and knowledge in managing refurbishment, however, are still sparse. The Refurbishment Research Group of the Institut Teknologi MARA has already taken initiatives to spearhead in this area.

**Dr. Ismail Rahmat**

Bureau of Research and Consultancy  
Mara Institute of Technology

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## The CSR Autoclaved Lightweight Concrete (ALC) Building system



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The fact that the blocks can be cut and worked like timber, along with their lightweight and dimensional accuracy, results in reduced construction times and economies compared to traditional building materials.

The design future of the CSR ALC building system facilitates to use the system in all types of buildings including homes, townhouses, condominiums, commercial buildings or industrial complexes.

# Short course on distress investigations and rehabilitation of buildings

The Housing Research Centre (HRC) hosts a three-day specialist course on 'Distress Investigations and Rehabilitation of Buildings' from 27<sup>th</sup> to 29<sup>th</sup> September, at Universiti Putra Malaysia. The course will be conducted by distinguished speakers including Prof. Dr. D.N. Trikha, Assoc. Prof. Ir. Dr. Abdul Aziz Abdul Samad, Ir. Dr. Saleh Jaafar, Dr. Waleed Abdul Malik Thanoon and Ir. Dr. Judin Abdul Karim.

In recent past, construction proceeded at an alarming speed, which often led to missing fine details and overlooking established procedures. As a result, some buildings have shown signs of distress immediately on completion but more often after 10 to 15 years of construction as against the expected life span of 100 years. Catastrophic failures have also been reported, although post failure inquiries have rarely been conclusive.

The three-day specialist course is designed to equip the participants with the latest information on distress diagnostics and rehabilitation. Investigation strategies including non-destructive techniques shall be discussed. The course intends to discuss in detail the repair as well as strengthening techniques for enhancing structural strength.

## Course contents

The course will cover types of distress and possible reasons. Various building systems and materials in vogue shall be described and analysed to link their structural behaviour and performance under normal and environmental loads to the potential type of distress. The course will deal exhaustively with investigation strategy for distress diagnostics and procedures for rehabilitation and enhancement of performance. A special feature is the discussion of important case histories.

## Who should attend?

Practising design and construction engineers, architects and government/semi-government agencies involved in construction, private contractors and builders, academicians and researchers are the groups most likely to benefit.

## Registration

Ring (03) 948 6101 – 2100 or fax at (03) 943 5821. Telephone bookings must be followed by writing.

## Mail on company letterhead with appropriate payment to:

Housing Research Centre  
Fakulti Kejuruteraan  
Universiti Putra Malaysia  
Serdang, 43400 Selangor Darul Ehsan  
Attn: En Azizan Naim

Fees per delegate is RM 550. It includes tuition, training materials, lunches, refreshments and certificate of completion. RM 450 per delegate will be charged when three or more delegates participate from the same organisation. Payment should be made by cross cheque or bank draft payable to Universiti Putra Malaysia.

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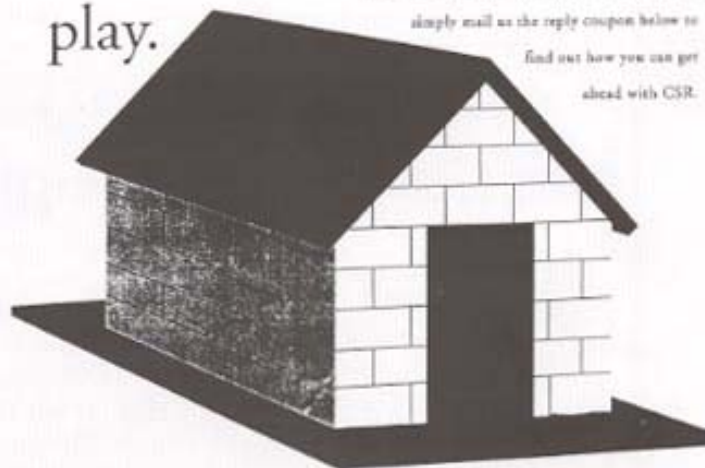
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# Specialist conference on Industrialised Building Systems and Structural Engineering

Under the aegis of the World Engineering Congress held on 19 – 22 July, 1999 at Sheraton Subang Hotel and Towers, Kuala Lumpur, a Specialist Conference on Industrialised Building Systems and Structural Engineering was organised, which attracted a total of 37 technical papers from both within and outside the country. Several countries like Japan, USA, India and Sri Lanka were represented.

In the two sessions devoted to Industrialised Building Systems, delegates were exposed to topics ranging from modular co-ordination, construction management, and panel systems to fire resistance. In the session on Materials, highly complex simulation model for concrete deterioration under chloride attack was presented besides papers on high performance concrete. In the sessions on Structural Engineering, the papers covered almost all current interests such as finite element modeling, wind engineering studies and distress monitoring of bridge structures. The highlight of each session was the lively discussion following each presentation.

In pursuance to the theme of the Congress – Global challenges and issues for the next millennium, two invited and two theme lectures were delivered by eminent experts. These highly informative lectures drew a lot of discussion and received high appreciation.

In all, the specialist conference was a lively affair whose fond memories will linger and be cherished for long time to come.

Prof. Dr. D. N. Trilcha

Selangor Darul Ehsan Chair in Advanced Construction Technology  
Chairman,

Specialist conference on Industrialised Building Systems and Structural Engineering

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## Thermal insulation of building materials

also affected by the 'Thermal Response' of the building material used.

Nowadays, these thermal properties of building materials are very useful in the design of building envelope. The new design criteria called the Overall Thermal Transfer Value (OTTV), where its derivation is associated with thermal transmittance, U of opaque wall, has been adopted to achieve energy efficiency in air conditioned buildings. The aim is to achieve a design of building envelope that can cut down external heat gain and hence reduce the cooling load of the air conditioning system.

In our effort to promote the use of energy efficient building materials, SIRIM Testing Services Department is developing schemes to provide testing for thermal

resistance rating, R ( $R=1/U$ ) of building materials for local industries. The service will be made available when new testing equipment is ready in early 2000. It is anticipated that the scheme will create high demands especially for products such as windows, doors, skylights and glazing. This would definitely assist local building materials industries to achieve higher standards, contribute to conservation of energy and help manufacturers to be better placed to compete in the global market.

Mohd Fauzi Ismail

Manager, Construction & Building  
Materials Testing Section  
SIRIM Berhad

## Research Contract with ICP

Industrial Concrete Products (ICP) is one of the major suppliers of concrete products in the Malaysian construction industry. ICP is currently developing high performance concrete products so as to enter overseas markets. In pursuance to this objective, ICP has recently entered into a research contract with the HRC to investigate the short term and long term characteristics of the proposed materials and final products. Of special interest, the durability of the finished materials would be studied. The study would enable the ICP to determine the earliest age at which the products can be commercially utilised.

## HRC SERVICES

HRC offers to work intimately with developers, government agencies and consultancy firms 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

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[PMT] is a *Technology Specialist Company* established in 1991. PMT is a wholly-owned Bumiputera firm and is based in Seri Kembangan, Selangor.

At its initial stage, PMT's focus is in the **Environmental Consultancy** sector such as Environmental Impact Assessment (EIA) Studies, Wastewater Treatment Systems (Domestic and Industrial), Environmental Monitoring Works and other environmental related studies. PMT is a registered Consulting Firm with the Department of Environment (DOE) Malaysia.

As the company progresses, PMT has created another division to improve and cater the growing needs of its service to clients. Therefore, the **Wastewater & Construction** Division was created; which concentrates on the design and construction of wastewater treatment plants, civil engineering works, building works and mechanical works. PMT is currently registered with the Construction Industry Development Board (CIDB) under Class IV. PMT is also registered with Pusat Khidmat Kontraktor (PKK), with Bx license and Bumiputera Status. In addition, PMT is a licensed Sewage Treatment Plant Contractor (Class D) with the Jabatan Perkhidmatan Pembetungan (JPP).

A new division was created in 1999, which is the **Laboratory Specialist** Division. This division focuses on the design, construction and supply of laboratory facilities for various institutions like the universities, hospitals, schools, laboratories and research institutions. PMT is registered with the Ministry of Finance for the purpose. PMT now has three major divisions for its business activities:

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- Industrial Wastewater Treatment Plant Works
- Treatment Plant Refurbishment, Maintenance and Upgrading Works
- Civil and Structural Engineering Works
- Mechanical Engineering Works

**(II) Environmental Consultancy Division**

- Environmental Impact Assessment (EIA)
- Environmental Studies: EMP, Auditing etc.
- Environmental and Post-EIA Monitoring

**(III) Laboratory Specialist Division**

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PMT also understands the importance of **Research and Development** as a company like PMT must always be at the forefront of the technology. Therefore, PMT has linked itself with the Waste Technology Centre, Universiti Putra Malaysia. PMT is proud to be the marketing and development agent for the patented wastewater treatment packaged plants (aerobic & anaerobic types), named **Biofil**. The *Made in Malaysia* treatment system is invented by Assoc. Prof. Dr. Azni Idris, who is also the Technical Director for PMT.

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