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Editorial

Building failures are common these days. Significant cost is incurred in repairing structural damage and often more spectacular failures result in loss of life. Other than natural causes such as earthquakes and hurricanes, man-caused failures are of prime consideration of this edition.

Most common failures include leaky roofs, cracked floors, sewerage problems, foundation settlement, plumbing and electrical systems. Deterioration in building components such as exterior cladding, windows, doors and so on also attributes to failures. It has been reported that building types accounting for 80 percent of reported incidents include multi-family, educational, office, health, retail, lodging, and warehouse.

Most of the failures are related to decisions during the design stage. Buildings can fail due to bad conceptual design and constructability problems. For instance, when the stiffnesses of floors in a building are different and so varied, it may affect structural behaviour so much as to eventually cause collapse. Adequate attention must be given to the conceptual design and that constructability input to the design right from the conceptual stage is crucial to avoid failures in buildings. ■

Deficient Designs Leading to Distress in Building

Prof. Dr. D.N. Trikha

Some recent head-lines catching failures of buildings resulting in huge loss of life and property in different parts of the world are clear indicators that all is not well with our design and construction practices. This is all the more disquieting as advances in computer-aided analysis and design as well as construction practices have indeed been impressive in the last two to three decades.

Besides these failures, there are equally worrying cases of distress of various kinds reported in even newly constructed buildings, as such distress ultimately leads to durability related continuous deterioration of structures and reduction in useful life. If legal and compensatory matters are left alone to be dealt by appropriate authorities, there still remain the professional concerns of the engineers, the builders and the contractors requiring some deep introspection for self-correction. A few issues are raised below.

A tall structure rarely develops cracks due to overloading but

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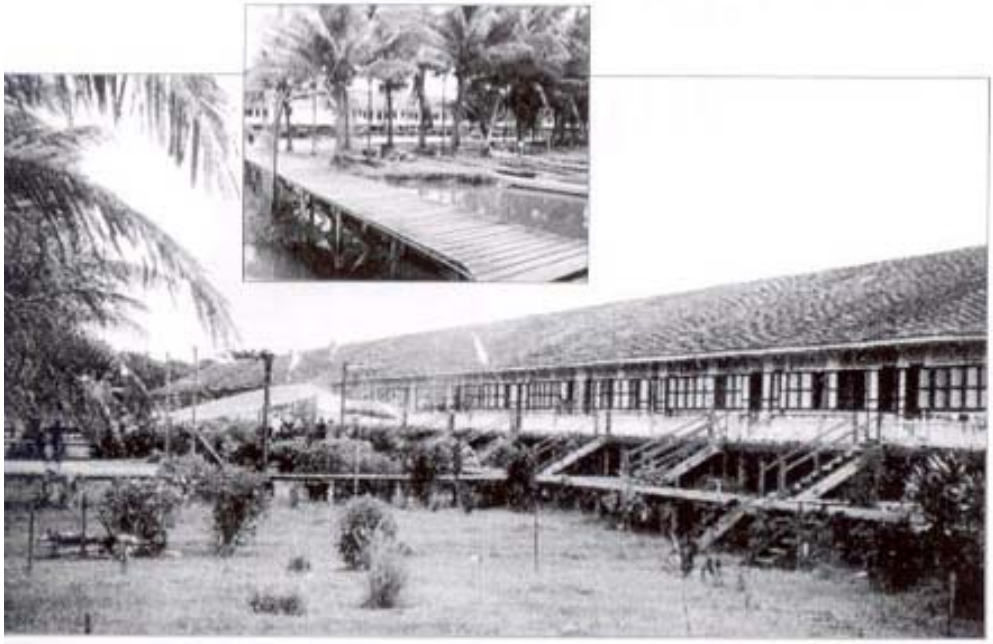
PRESERVING THE DAYAKS LONGHOUSE – HRC's view

A report from the Seminar on 'Sarawak's Traditional Housing'



Sarawak, in the Island of Borneo, is a very unique state. It is enriched by the cultural diversity of its multi-ethnic heritage. Each of these ethnic groups has its own specialty and uniqueness which are not only the identity and pride of the group, but also the pride of all Sarawakians alike. The concept and design of the traditional houses belonging to different ethnic groups convey their functions varied with the purpose of providing security and safety to the group's families.

At the moment, rapid development is being experienced by the state of Sarawak and the ethnic groups are not precluded from the modernisation process. Modernisation has influenced the concept and design of traditional houses through various changes. In lieu of this, the state government hopes that the design of the traditional houses belonging to Sarawak's various ethnic groups can be preserved and made popular. Efforts are being made to upgrade the quality of the house so that they are comfortable yet safe for the residents.

With the above in mind, on 24th and 25th September, 1999, the Ministry of Housing and Local Government, the Sarawak Ministry of Housing and the Sarawak Commisssioner of Housing and Development, organised a 2-day seminar on the Sarawak's Traditional Housing. The theme is *"Sarawak's Traditional Housing Towards the New Millennium"* which was held at the Rihga Royal Hotel in Miri, Sarawak. There were about 250 specially invited participants consisting of relevant government agencies, academicians and all levels of ethnic group> administrators. Prof. Dr. D.N. Trikha and Puan Rahinah Ibrahim represented HRC at the seminar.

The objectives of the seminar were: to understand the importance of planning, concept and design of traditional houses in Sarawak; to provide exposure to participants on the importance of having an orderly, clean and safe traditional house; and to continue research towards the need to conserve and promote suitable traditional house design that reflects various multi-ethnic groups of Sarawak. This seminar was noticeably an important issue in Sarawak today because several Ministers and Vice-Ministers were present throughout the 2-day seminar.

The research team of the HRC on new longhouse is comprised of Puan Rahinah Ibrahim (team leader), Dr. Nor Mariah Adam, Prof. Dr. D.N. Trikha and Prof. Ir. Abang Abdullah Abang Ali. The research is limited to the Ibans of the Dayak groups and the extract of the paper presented by the HRC-team is as follows.

Several issues that influence the environmental planning and design of a new Iban longhouse have been

identified. First is the transportation and communication problems. Road infrastructure is very expensive for a land criss-crossed by many rivers compared to the ratio of population it is serving. At the moment, laterite roads link one house to another. These roads facilitate the provision of electricity and telephone inland. Water transportation is very slow and is seasonal too. Four-wheel drive vehicles is the best mode of travelling nowadays, and parking spaces for them has to be incorporated. Future travel mode is by helicopter. Travelling mode is very important considering the delivery of building materials that has to take place for any new development.

Another planning issue that needs immediate attention is the need to provide minimum basic services for the comfort of the longhouse residents. These services include clinical, school, water treatment system, liquid and solid waste disposal systems, energy source and delivery services. Further study is needed to determine strategic logistic locations for these public services so that they can be shared by a cluster of villages. Two more essentials are the safety and fire-prevention aspects for the longhouses and supply of clean water.

A third issue is the change in social conditions. As the ethnic groups are no longer enemies and live peacefully with other groups, requirements for security against attacks therefore need not be emphasised any more. Hence, the spatial requirements and their layouts can be modified according to the site condition. HRC proposed that the function of the house be doubled to include sleeping, cleaning and food preparation areas.

In addition, resettlement of Iban communities nowadays occurs because of fire and not due to bad omens. It is safe to conclude that the longhouse community of the Ibans are stable and thus allowing a fixed development to be planned for them.

Another important aspect for any new development for the Iban community is that the development has to be the catalyst to upgrade the existing economy of the people. This must be so especially when development is planned in the interior of Sarawak. Cluster development is suggested whereby services such as education and other basic amenities can be provided at a lesser cost. New developments would provide easier accesibility by air, land and water. These cluster villages have basic amenities yet provide the residents with an opportunity to live in the tropical forests where their ancestors lived. In fact, these developments could become weekend retreats such as beach retreats for the Peninsular residents.

In the HRC's proposal, the Iban longhouse is planned to be upgraded to suite the present contextual conditions, based on the traditional longhouse design. The HRC's design objectives are to preserve the culture of the Iban society and to design an environmental friendly modern longhouse.

At the end of the seminar, many accepted that the longhouses need to be upgraded on their amenities, fire and safety prevention, building materials and construction technology. However, many maintained that designers need to understand the lives of the indigenous people so that they will design a new longhouse which is an embodiment of their cultural well-being. This is true, as the most significant point throughout the seminar was the way communal living occurs in a longhouse and should be the envy of everyone in times when individuality prevails among the urban communities. ■

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Universiti Putra Malaysia's Millennium Gift to the Nation:

ITMA

INSTITUT TEKNOLOGI MAJU

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In its pursuance to provide leadership in research and development work in cutting-edge areas of physical science, information technology and engineering in the next millennium, University Putra Malaysia has launched The Institute of Advanced Technology (ITMA) on 1st November 1999. ITMA shall develop world-class research laboratories in niche areas of advanced technology, attract renowned researchers as well as train future research leaders in advanced technology. ITMA shall share its research findings, expertise and facilities with research communities and industries throughout the world.

The key objectives of the ITMA are to:

- Undertake, coordinate and lead interdisciplinary research and development work in cutting-edge areas of advanced technology.
- Offer postgraduate training programmes at the M.S. and Ph.D. levels to local students and those from abroad.
- Develop a technology transfer centre and network with universities, laboratories and industries globally.

To achieve the above objectives, ITMA plans to focus on selected research thrust areas which are important for the development of fundamental scientific and engineering knowledge and establish four centres of excellence during the first phase of its development as follows:

Advanced Materials Research Centre (AMRC)

Magnetic Materials, Superconductors, Dielectric materials, Semiconductors, Composites, Ceramics, Photonics

Numerical Modelling Research Centre (NMRC)

Computational Fluid Dynamics, Boundary element, finite element and hybrid element methods, numerical modeling & simulation, virtual manufacturing & design, computational biomechanics.

Robotics Research Centre (RRC)

Artificial intelligence, mobile robots, neurodynamics, nonlinear adaptive signal processing, biophysics of computation, automation and control systems, parallel architectures for knowledge representation & inference.

Advanced Construction Technology Research Centre (ACTRC)

Computer integrated construction (CIC), Industrialised building system, modular coordination, expert systems, automation & robotics and smart materials.

ITMA is actively pursuing funding from various organisations to enable the development of world-class laboratories and intensive research work in the above areas at the institute. ITMA intends to provide the latest high performance computing facilities at its computer laboratory to enable staff and students to handle large computational problems as well as fast graphics.

Management and Staff

ITMA shall be guided by an Advisory Committee chaired by the Vice Chancellor, Universiti Putra Malaysia. Other members of the committee comprise of relevant Deans and Directors from the university, Directors of national research centres as well as representatives from related scientific and professional societies and associations representing the industries. An international advisory panel shall also be appointed.

The institute shall be led and managed by the Director, Professor Abang Abdullah Abang Ali and assisted by a Deputy Director. In its first phase of development, four Heads of Centre have been appointed to manage the Centres of Excellence.

Nine research staff comprising of 2 Professors, 3 Associate Professors and 4 Lecturers from the Science and Engineering faculties have been appointed as founding members of the institute and attached to different centres. Part-time research fellows shall be appointed from time to time to the four centres. Two Administrative Staff have just joined the institute recently.

ITMA shall invite world-renowned researchers to join its research teams.

Of special interest to our readers will be the ACTRC and its research priorities.

Advanced Construction Technology Research Centre (ACTRC)

As one of the four advanced research centres, the Advanced Construction Technology Research Centre (ACTRC) aims to become a regional research centre in the area of Advanced Construction Technology. It is proposed that the Centre be equiped with all infrastructure including four laboratories: Concrete Materials and Composites Laboratory; Construction Engineering Laboratory; Large Structures Laboratory; and Computer Aided Design Laboratory. The focused research areas of the Centre are as follows.

Innovative structural systems and materials

The conventional cast-in-situ concrete construction method has been used for years in Malaysia. A change towards an improved construction technology using innovative structural systems and materials is needed to meet the challenges ahead in terms of quantity and quality. The research thrust will be on the development of new and smart materials, building components, and connections, building systems and smart structures that meet the needs of the industry.

Structural life prediction and assessment

Maintenance is an important integral of the life span of the structure. The research thrust under this area will be on monitoring and evaluating the deterioration and capacity of structures under various conditions. The use of fiber optic sensors as a monitoring device under real conditions will be conducted.

Computer Integrated Construction (CIC) and Automation

The key issues include the development of an integrated analysis, design, drafting, fabrication, erection and evaluation of a building. The investigation on automated construction techniques using robots will be emphasised with the development of building components and jointing mechanisms.

Expert System on Building System and Design

The research thrust will be on the development of an Artificial Intelligence (AI) and Artificial Neural Network (ANN) providing on-line solution and advice in the area of building and design. ■

For more information: Please contact
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Prof. Abang Abdullah Abang Ali or
Deputy Director
Dr Shahnor Basri of ITMA.

NAM Project on Low Cost Housing Technology

The Centre for Science & Technology of the Non-Aligned and other Developing Countries held its 2nd APEX Group meeting on its Collaborative Low Cost Housing Technology Programme on 1-2 Nov. 1999 at Delhi. The following countries are participating in the Programme:

Asian Region	:	Bangladesh, Pakistan, Lebanon, Sri Lanka, Malaysia, Nepal and India.
African Region	:	Burkina Faso, Ethiopia, Tanzania and Togo
Latin American Region	:	Colombia

In the first meeting of the Apex Group in Sept. 1998, the Regional Co-ordinator for the African Region, Mr. Elias. M. Kwanama from Tanzania had presented the country reports of the African Region giving vital housing related data including current technologies, practices and policies of the Region. Mr. Padmasiri Perera, Regional Co-ordinator of the Asian Region likewise had presented the Country Reports for the Asian Region. Based on these Reports, the Regional co-ordinators were asked to prepare low cost technology housing schemes for their respective regions for both rural and urban areas.

In the second meeting in Nov. 99, Mr. Kwanama presented low cost technology housing schemes appropriate for rural and urban areas for the African Region. Pn. Dang Anum representing Malaysia, presented the schemes for low cost housing for rural and urban areas, as prepared by Mr. Perera. These schemes were based on the regional requirement as well as levels of technology in the region.

After detailed discussion, it was agreed that the low cost housing schemes should be further improved in the form of Builders' Hand-Book for each region accompanied by structural drawings, specifications on materials, bills of quantities etc so that the Hand Book provides the comple. engineering information which can be employed for house construction without need for any further reference. It was also agreed that two or three alternate structural systems each for rural and urban areas for each region are developed. The task has been targeted to be completed in the next 6 to 8 months.

Prof. D.N. Trikha, HRC (UPM) as the consultant to the project, chaired all the sessions on the two days. ■

Prof. D.N Trikha
Executive Director, HRC

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Deficient Designs Leading to Distress in Building

is seriously affected by support settlements. Currently, it is not even considered economically attractive (in the face of competitive bids) to insist on soil investigations for the estimation of soil settlements and to cater for differential settlements in design. A simple exercise to consider differential settlements as permitted in building codes in the design leads to uneconomical column sizes and beam depths. However, a more rational approach which considers soil-structure action for analysis, if adopted, would lead to acceptable member dimensions to accommodate support settlements. Since engineers are not keen, probably due to unfamiliarity, with calculations based on soil-structure interaction, it often leads to deficient designs by default.

Yet another design deficiency occurs when wind loads on buildings especially exposed to gusty winds in coastal areas are treated as equivalent static loads in case of tall structures exceeding 15m to 20m heights. It is well known that dynamic magnification may increase design forces substantially. Tall structures especially chimneys and towers (both antenna and transmission) are susceptible to dynamic effects of winds. It is surprising that no industrial wind tunnel exists in the country to determine response of such structures to dynamic wind effects, and the response of grouped buildings.

It is well known that flexural and shear cracks may also result from poor detailing of reinforcement like abrupt cut-off, inadequate over-laps and at cut-outs. These cracks may not appear to be dangerous, but they definitely lead to deterioration of structures due to increased corrosion arising from easy and direct ingress of harmful salts in coastal areas.

Another dangerous practice is to ignore effect of differential temperatures between the exposed columns and the internal columns which are located in air-conditioned environment. The relative changes in column lengths may result in excessive design forces especially in the interconnecting beams. Little thought at present is given to this aspect in design.

Durability plays an important part in ensuring design life of structures. At present, durability is treated as an independent aspect of construction. It is high time that durability becomes an integral component of design process.

Reinforced concrete structures can be built to last over 100 years provided they are continuously monitored for any unexplained cracks or settlements, so that remedial retrofit measures are undertaken at an opportune time. This is possible only if maintenance is not treated simply as patch work and white-wash job but a scientific discipline requiring knowledge of principles of design and detailing, construction practices, material technology, diagnostic investigation and appropriate remedial measures.

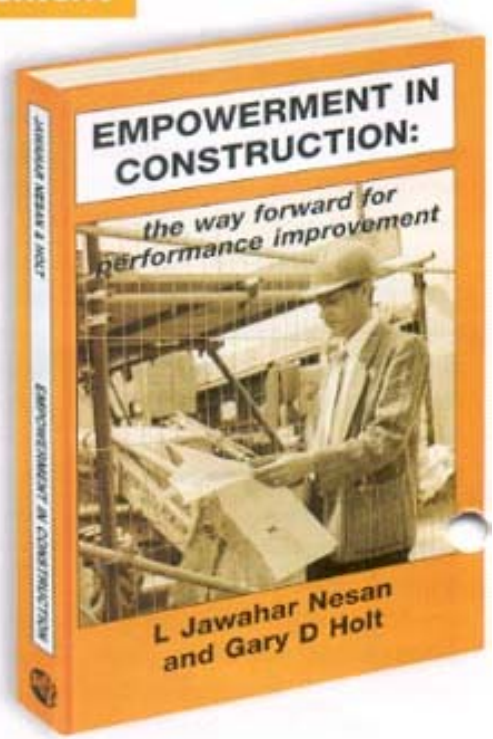
Has the engineering profession the will to monitor at least some important buildings, continuously as a scientific investigation exercise instead of the casual visual inspection process as at present? ■

Prof. Dr. D.N. Trikha
Executive Director, HRC

Book Publication

EMPOWERMENT IN CONSTRUCTION:
the way forward for performance improvement

Publisher: **Research Studies Press Ltd**
15/16 Coach House Cloisters
10, Hitchen Street, Baldock
Hertfordshire, England, SG7 6AE



In this essential book, Dr. L. Jawahar Nesan of University Putra Malaysia and Dr. Gary Holt of University of Wolverhampton have developed and reported, a novel approach to implementing the philosophies of empowerment, TQM and other innovative techniques in construction. The authors have coined the term "New Construction Philosophy" (NCP) to describe a holistic and integrated approach to overcoming the problems associated with poor quality in the construction industry. The NCP addresses and identifies the relationship of change needed at both the organisational and project levels to achieve process improvement.

The objective of the book is to improve the performance of both 'people' and 'process' aspects of the construction business. Poor performance of one impedes improvement of the other, such that improved quality and productivity lies in the structure of the process itself. Several illustrated examples, detailing how to solve the real world problems and improve construction processes, are provided in the book.