Timber Engineering Research and Education in Malaysia

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Summary

The current state of affairs in Malaysia is that the interest in using timber as a structural member is almost non-existence. Use of structural timber currently is limited to formworks and trusses. Even in this usage it is competing fiercely with steel and other materials. Knowledge on timber properties and design are also lacking among the architects and engineers. In terms of timber researches, a number of research works are currently being conducted while in education only a few universities are offering courses on timber design. As works that needed to be done, the main emphasize should be in terms of promotions. These include conducting short courses, seminars and producing relevant timber design materials to the engineers and architect, in particular, and the public in general. Works to lobby the appropriate authorities to include timber design in engineering course in universities and to change by laws that restrict the use of timber as construction materials should also be emphasized.

1. Introduction

Timber has been used throughout the history of mankind and has provided humans with a broad range of building products and construction materials. Modernization and technologies of the construction industry and efforts to minimize costs, new construction materials have come to the fore i.e. concrete, steel. To make use of this material, some basic principles need to be considered such as variety of choices for appropriate use, strength, stability, durability, economics, able to shoulder responsibility and amenable to technical skills required for the application. Many reasons why timber was choose as a component in structural application. History shows that apart from stone, timber had been around since ancient time as construction materials. While stone gradually had been diminished and replaced by today's concrete, timber on the other hands remain as the most important construction materials.

With the evolution of time and experience, designers have learned to design timber structures based on engineering principles. With the introduction of various standard procedures and codes of practice, designers can be well assured that their design will attain certain level of safety and strength requirements. Over the years the designs evolved. More and more rigorous and difficult structural designs introduced and to some extent proved to be too complex and difficult to apply. This proved to be main factor that limits the usage of timber as structural materials. With the introduction of "engineered timber", this problem progressively overcame.

Malaysia is one of the main producers of the world's good quality timbers that are very highly demanded all over the globe. However it is unfortunate that the country does not fully utilize her rich resources in the field of engineering in general and as structural materials in particular, in contrast with well-developed countries. The interest in using timber as a structural member in the country is almost non-existence. The usage is limited to formworks and trusses and is facing fierce competition other materials. Knowledge on timber properties and design are also lacking among the architects and engineers. This phenomenon is understandable as only a few universities are offering courses on timber design. In terms of timber researches, a small number of research groups are committed to timber research and promotions.

2. Current research on timber engineering

In the country, there are only a few research works are done on timber engineering compared with another materials such as concrete and steel due to fewer promoting on timber structure to the professionals and public. However, this situation does not consequence the effort to versatile usage of timber in engineering purpose. Research on timber engineering in Malaysia was begun late sixties by Forest Research Institute of Malaysia. (FRIM). After that, several universities and organisations are took part in developing timber usage for structural use such as Universiti Malaya, Universiti Putra Malaysia, Universiti Teknologi Malaysia and Kolej Universiti Tun Hussien Onn. Meanwhile, the organisations are involved such as Malaysian Timber Industry Board (MTIB), Construction Industry Development Board (CIDB) and Malaysian Timber Council (MTC). The research areas are including developing Code of Practise MS 544, strength of timber joint, engineered wood product and roof truss.

2.1 Composite

There were some researches on structural timber-concrete composite structures like composite beam being conducted by local researchers since the 80s (Mat Lazim Z., 1986 and Mohd. Zulkifli G., 1989). However the interest among the researcher in this field had subsided perhaps with the intensity of competitiveness from other materials. In 2002 the composite timbers truss i.e. MiTek Matrix roof truss system was introduced in the country. The feasibility of the truss under local condition has been studied locally and this in general helps the development of interest in timber composite materials.

2.2 Engineered Timber

Structural timber which includes strong solid timber, glulam and laminated veneer lumber (LVL) has gained popularity not only in term of usage and application but in research field as well. Due to its wide range of applications such as engineered multi-storey projects, large trusses and glulam beams and arches, the industry has progressively improving.

Research on engineered timber focus more on glulam and LVL as a structures, fire protection and wood preservatives and usage of composite materials likes fiber-reinforced plastic (FRP) composites for reinforcement of wood (M.Z. Jumaat, 2001). Mechanical characteristics and physical properties of these materials were also reviewed. The investigation also includes non-destructive evaluation, studies on creep and load duration.

2.3 Connections and Joints

Timber joints perhaps are the most common research area among researchers in Malaysia. The fact that the joint itself not only the most important part of any timber structures but also the weakest point may be the factor behind this trend. Despite the extensive research the behaviour of timber joints are not fully established until today. The combination of anisotropic behaviour and the nonlinear material properties contribute to the difficulties in further understanding timber joints.

Among the research that was or being conducted is the determination of the strength of timber joints under axial and bending project which was headed by the author. The behaviour of other mechanical connectors such as metal plate on engineered timber member is also being studied. (David Yeoh et.al., 2004).

3. Education

In terms of education, courses related to timber engineering are very limited. Out of about 30 institutions of higher learning in the country, only a handful run courses related to timber engineering. The scenario is similar in Continuous Professional Development courses organized by the engineering related professional bodies like the Institution of Engineers Malaysia and the Board of Engineers Malaysia. The reason for these include,

i. Demand for constructing timber structures is very low
ii. The number of competent lecturers and professional to teach timber engineering courses are limited

iii. Prejudice on timber structures is very widespread

To overcome this, promotional efforts have to be intensified.

4. Efforts in promoting timber engineering

Use of timber for non-structural applications such as formworks, paneling, partitions, is plenty in the country. What is lacking, perhaps, is the use of timber for structural applications especially for heavy weight constructions such as portal frames and large size beam and column constructions. The use of timber, especially engineered timber, in heavy constructions in the developed countries such as Australia, New Zealand, the United States and Europe is not something new. Sadly to say in Malaysia, which is a timber producing country not even one can be found. This rapid development in timber technology worldwide is yet another issue the local timber industry has to deal with.

In order to promote timber engineering, efforts to encourage usage of timber for these types of applications must be made. The steps to be implemented include the followings,

i. Produce books, design guides and leaflets on timber usage and design and make these easily available to the relevant people in the construction industry.
ii. Encourage Institute of Higher Learning that offers courses in Architecture and Civil Engineering to include timber design in their curriculum
iii. Organize short-courses, seminars and conferences related to timber design.
iv. Promote timber usage to the relevant bodies such as the Public Works Department and Local Authorities.
v. Promote timber usage to the public through the mass media.

4.1 Codes of Practice

The development of up-to-date codes of practice is essential step in the promoting effort. However, the code of practice itself evolves with time as more and more designs are pushing to the limit of greater reliability with regard to safety and greater economic values. The code changed from the Working Stress Design to Limit State Design which is currently widely being used in structural design. Although there are numbers of code of practice available worldwide with regard to structural timber design, the development of the new Malaysian code of practice only materialized recently.

The new MS 544 2001 code (Anon, 2001) which superseded the old version (Anon, 1978) is separated into several parts and sections, under the general title, `Code of practice for structural use of timber'. It has 12 main parts altogether which covers the solid timber design, glulam design, timber joints and structural applications of LVL among others. Effort to improve the code to cater limit state design method in particular timber joints is currently being pursued.

4.2 Industrialized Building System

The introduction of Industrialized Building System (IBS) by CIDB recently is the latest step taken by the authority to further increase the usage of structural timber in construction. Include in the IBS is the prefabricated timber frames. The areas to be looked into include structural performance, fire performance, acoustic performance, racking performance, durability, thermal comfort, cost analysis, build ability and life cycle analysis. The group also focuses on developing other light and heavy structures i.e. timber bridges and industrial buildings and development of engineered timber products.

5. Concluding Remarks

In conclusion even though the use of timber in the country is quite limited, it is hope with the enthusiasm shown by the timber interest group, things will get better in the future and timber will be given its rightful place in the construction industry. It is also hope that by outlining the difficulties encountered, researchers from the developing countries will share their problems and experiences in overcoming the problems.

In this new era of globalization, new strategies on education need to be developed and promoted in engineering education to meet the challenges of the ever-changing and diverse world. These

strategies need to cover not only the educational aspects, but also the personal and professional development. Through the active engagement in the professional body activities, these problems can be overcome.

6. References

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