

Timber use Practices in Malaysia's Construction Industry: Single-family Residential Building Sector

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ABSTRACT

The importance of domestic timber market in Malaysia is recognised with the launch of the National Timber Industry Plan in 2009, which calls for promoting and encouraging the use of timber products by the local construction industry. A study was conducted to provide information on the current use of timber products in the single-family residential building sector as it is one of the major development projects undertaken by the construction industry. In specific, the study aimed to identify the types and to estimate the amount of timber products used in the construction and those installed in the completed single-family residential building units. Data for the study were collected using a self-administered, open-ended questionnaire sent to constructions firms in Selangor and the Federal territory of Kuala Lumpur advertising the sale of their residential building units in the local newspapers and the internet during the survey period. The respondents of the study were project managers or quantity surveyors who were involved directly in the supervision and monitoring of the residential projects constructed by the construction firms. The amount of sawn timber and plywood used for the construction of the residential units ranges from 0.05 to 0.07 cu. m/sq. m. and 0.01 to 0.07 cu. m./sq. m., respectively. The most common timber products installed in the completed residential units are wooden/timber doors. Other traditional timber-based products are still being used but they are continually replaced by other building materials such as aluminium, steel and glass. Efforts to promote timber products to the single-family residential building sector should target on their uses in the completed residential building units.

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INTRODUCTION

The timber industry in Malaysia caters timber products for not only the domestic but also the international markets. Despite being an important market outlet for timber products, most domestic markets including Malaysia's, generally receive less attention as they are almost always overshadowed by exports (Bourke, 1991). In 2008, for example, domestic consumption of primary timber products and furniture in Malaysia worth about RM7.6 billion, while export of timber and timber products was about RM22.5 billion (MPIC, 2009). However, the scenario in Malaysia was expected to change with the launch of the National Timber Industry Plan (NATIP) in 2009 which recognized the importance of the domestic timber market. NATIP calls for promoting and encouraging the use of timber products in the domestic market to sustain the growth of the country's timber industry (MPIC, 2009). The plan targets the construction industry as it has been the largest consumer of sawn timber, plywood and other wood-based panels in the country.

Even though Malaysia is a timber-rich country, the use of timber products in the construction industry is almost negligible (Wong, 2008). Jumaat *et al.* (2006b) lamented that the construction industry in Malaysia is not very keen in using the material. Various reasons such as poor and inconsistent quality, association with low social status and fire performance, as well as high and fluctuating cost of the material have been cited for the construction industry's disinterest in using timber products (Tan

et al., 2005; Ismail *et al.*, 2008). Similarly, the lack of consumer awareness on the availability of Malaysian timber species and products in the local market has also been cited for the continued use of imported timber or alternative materials such as plastic in the building and housing sectors (MPIC, 2009). The diminishing number of timber craftsmen was also another factor for the use concrete and masonry materials for residential buildings in rural communities in Malaysia (Ismail *et al.*, 2008). The industry is also increasingly using other alternative materials such as bricks and concrete (Nor Haniza *et al.*, 2007; Fujita *et al.*, 2009; Abu Hassan *et al.*, 2011). In 2008, for instance, timber products constitute only 8% of the total materials used by the Malaysian construction industry compared to 23% each for iron and steel, and cement and concrete (SEAISI, 2008).

There is, however, a general lack of detailed studies on the use of timber products not only in the Malaysian construction industry but also in other major timber product consuming sectors. A study was, thus, conducted to provide information on the use of timber products by the Malaysian construction industry, especially in the residential building sector as it is one of the major development projects undertaken by the construction industry. In more specific, the study aimed to identify the types and to estimate the amount of timber products used in the construction and those installed in the completed single-family residential building units. In 2011, about 28% of the total 5,555 projects awarded to the construction

industry were for residential building construction (CIDB, undated). This study focused on the use of timber products in the construction of single-family residential units by building construction firms; hence, it did not include units constructed by individual house owners. Single-family residential units include detached, semi-detached and terraced houses, in which each unit is separated by a ground-to-roof wall and where no other units are constructed above or below it. During the third quarter of 2011, about 63% of the 4.49 million residential units constructed in Malaysia were single-family residential units (NAPIC, 2011).

METHOD

Initial visits to four construction sites were done to identify the type of timber products used in the construction of single-family residential units. Other applications of timber product in the completed residential units were also identified. The information gathered from the visits was used to construct a questionnaire that was later employed in collecting the required data for the study. During the initial visits, the most appropriate persons to whom the questionnaire was to be sent were also ascertained.

The self-administered, open-ended questionnaire used in the study consists of two sections, which firstly collect the types, number, as well as the build-up area of each type of residential units the company is currently constructing. The second section of the questionnaire requires the respondents to provide information on

the types and amount of timber products used in the construction, as well as those used in the completed units of each type of house constructed. The questionnaire had been pre-tested with the four residential building construction firms visited earlier for its clarity and ease of obtaining the data on the types and amount of timber and timber products used in the residential building construction projects. The main concern raised by the respondents during the pre-test was the data on the amount of timber products used in the construction of each type of residential unit, as well as those used in the completed units. As it was deemed difficult to request data for a single unit of house constructed, the questionnaire was modified to obtain data on the types and total amount of timber and timber products estimated for each type of housing units currently or would be constructed by the construction firms.

The respondents for the study were the project managers or the quantity surveyors who were directly involved in supervising and monitoring the residential projects by the construction firms during the survey period. The survey was conducted in Selangor and the Federal Territory of Kuala Lumpur as high residential building construction had been recorded at the two states, as well as because of other logistic reasons. Out of 1,567 residential projects awarded in 2011, about 39% were awarded in these two states (CIDB, undated). Those construction firms advertising their residential building units in the local newspapers and the internet were contacted for the study. The questionnaire

was distributed to 58 project managers/ quantity surveyors who had initially agreed to participate in the study.

RESULTS AND DISCUSSION

Types of Single-family Residential Units Constructed

Data from 17 fully-completed questionnaires were used in the analysis. The most common type of single-family residential unit constructed by the respondents' firms is the double-storey terraced houses, with an average floor area of about 186.27 sq. m., followed by semi-detached and bungalows, and single-storey terraced houses (Table 1). In the fourth quarter of 2011, 2 to 3-storey terraced houses formed about 51% of the single-family residential units constructed in the Federal Territories of Kuala Lumpur and Putrajaya and in Selangor (NAPIC, 2011). In fact, 2- to 3-storey terraced houses are the most common types of single-family residential unit being constructed nationwide (Erdayu *et al.*, 2010).

Timber Products in Single Family Residential Units

Timber products are used both during the construction and for completed residential units. A majority of the respondents' firms

used timber formworks, fabricated of sawn timber and plywood, for the construction of concrete structures of the units. This conventional construction method is a common practice in Malaysia where reinforced concrete frame and brick, beam, column, wall, and roof are cast *in situ* using these timber formworks (Lou & Kamar, 2012). Sawn timber is also used as props and scaffoldings. The usage rates of sawn timber and plywood for the construction of the different types of residential units are shown in Table 2. The value was obtained by dividing the total volume of timber products that was being or would be used in the construction of the residential units (in cu. m.) with the total floor area of the units that were or would be built (in sq. m.).

The amount of sawn timber and plywood used for the construction of the residential units ranged from 0.05 to 0.07 cu. m./sq. m. and 0.01 to 0.07 cu. m./sq. m., respectively. The study by Monerasinghe (1985) reported about 0.05 cu. m. of timber materials was required for the construction of a square meter floor area for all types of houses. Meanwhile, Fujita *et al.* (2009) reported a much higher timber usage rate of 0.29 cu. m./sq. m. for low-cost and single-storey terrace houses,

TABLE 1
Type and average floor area of single-family residential units constructed by the respondent firms

Type of residential unit	Number of units constructed	Number of projects	Average floor area (sq. m.)
Single-storey terraced	247	3	120.07
Double-storey terraced	2357	13	186.27
Semi-detached & bungalows	772	8	290.68

and 0.13 cu. m./sq. m. for 2- to 3-storey terraced, semi-detached and detached houses. These researchers, however, did not indicate whether both sawn timber and plywood were included in their calculations. Furthermore, the researchers did not provide further information pertaining to the method used in obtaining the amount of timber and timber products in the construction of the building units.

The common sizes of sawn timber used by the respondents' firms ranged from 25.4 mm x 50.8 mm to 50.8 mm x 101.6 mm without any general indication of species or grade preference, while the 12 mm thick plywood were commonly used during the construction of the residential units. The timber formworks, props and scaffoldings are used several times before they are disposed, which is due to damages during dismantling, as construction waste. Similarly, Lee *et al.* (2013) reported that timber formworks would be used at least three times before they were disposed. Wood materials are reported to be one common waste component generated by the construction industry in the country (Begum *et al.*, 2006; Lee *et al.*, 2013). However, the use of sawn timber and plywood in the construction of residential

buildings is expected to continue in the future as the construction industry prefers this conventional construction method (Thanoon *et al.*, 2003; Abdul Kadir *et al.*, 2006).

In addition to being used during construction, timber products are also used in the completed residential units. Traditionally, these timber products included roof trusses and related members, doors and door frames, windows and window frames, decorative panels, skirting and flooring. Table 3 shows the various timber products used in the residential building projects surveyed in the study. The most common timber product found in all types of completed residential units surveyed in the study is doors. Solid timber doors are normally used for the main entrance, and sometimes for the master bedroom, while plywood flush doors are mainly used for other rooms. Nonetheless, there seems to be no standard number or dimensions for these doors as they vary from one residential building project to another.

The next common timber products are roof trusses and related members. Other timber products which are less commonly found in these completed residential units are door frames, fascia boards, stair parts

TABLE 2
Type and amount of timber products used in the construction of single-family residential units

Type of residential unit	Average floor area (sq. m.)	Usage rate (cu. m./sq. m.)	
		Sawn timber	Plywood
Single-storey terrace	120.07	0.07	0.01
Double-storey terrace	186.27	0.05	0.02
Semi-detached & bungalows	290.68	0.07	0.07

(especially handrails and post) and flooring. However, it is not possible to quantify the average amounts of the various timber products found in these residential units as there are variations in the units of measurements reported by the respondents even though they were requested to report using a common unit of measurement. Some reported that data were not available as these timber products were procured from their suppliers in assembled forms, and thus, they were not able to provide any details on the amount used in each completed residential unit. Roof trusses, for example, are normally prefabricated in the factories and transported to the construction sites (Jumaat *et al.*, 2006a). In general, most of the respondents interviewed reported that timber products constituted about 5% to 10% of the total volume of the materials used in a completed single-family residential unit.

Substitution of Traditionally Used Timber-based Products in Residential Building Units

It is evident, as shown in Table 3, that timber products which were traditionally found in the completed residential units

are being substituted with other materials. Wooden roof trusses are still being used in residential buildings, with a high percentage of the construction firms building semi-detached and bungalows now opted for steel roof trusses. Termite infestation, among others, has been cited as the reason for the construction industry’s tendency to use steel roof trusses (Mahmood *et al.*, 2005; Ngian *et al.*, 2012).

In addition to the roof/ceiling, other common locations of termite infestation in residential buildings are door and window frames, as well as flooring and baseboard/skirting (Lee, 2002). This has led the industry to substitute wooden door frames with those made of steel. It is more common now for houses to be fitted with casement windows with aluminium frames. While ceramic and porcelain tiles are replacing parquet flooring and skirting.

Cement boards and metal sheets are now being used by a number of residential building construction firms in replace of timber fascia boards. The most common reasons given by the respondents are the difficulty of obtaining straight, long pieces of timber and the tendency for timber fascia

TABLE 3
Timber products in the completed residential units

Type of timber product	Incidence - (% of number of projects)			
	Single-storey terrace	Double-storey terrace	Semi-detached & bungalows	Average
Doors	100	100	100	100
Roof trusses and members	100	62	25	62.3
Door frames	67	31	38	45.3
Fascia boards	33	46	25	34.7
Stair parts	-	31	38	23.0
Flooring	-	23	38	20.3

boards to rot as they are continuously exposed to the weather elements. Some timber products such as stair parts are replaced with stainless steel and glass as these new and modern materials have become easily available and well accepted by both residential building developers and buyers.

CONCLUSION

The most common type of single-family residential units constructed by the respondents' firms is the double-storey terraced houses, followed by semi-detached and bungalows, and single-storey terraced houses. Sawn timbers and plywood timbers are used in the construction of the single-family residential units but the usage rate is rather low. The most common timber products installed in the completed residential units are wooden/timber doors. Although other traditional timber-based products are still used, they are continually being replaced with other building materials such as aluminium, steel and glass.

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