

Investigating the Environmental Aspects of Courtyard in "Late Straits" Eclectic Style Shophouses, George Town, Malaysia

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Abstract: The shophouses architectural can create comfortable social and environmental weather aspects. Recent renovation indicates installation of sliding roofs with polycarbonate sheet coverings. Hence, the effect is that air circulation, natural ventilation and lighting would be reduced. This research aims to investigate the original environmental aspects of courtyard in terms of natural ventilation and natural lightings components preserved in these shophouses. The research employed qualitative method involving observation and architectural documentation. This paper adopted the Lot Nos. 3, 5 and 7 on Lorong Ikan built in 1926 because they are the typical shophouses and are categorised as the Late Straits Eclectic Style in Penang. The study findings demonstrated that the courtyard central is the major component in the environmental characteristics of a shophouse and a representation of the components of place identity, thus, should be preserved by stakeholders for the next generation.

1 INTRODUCTION

The traditional courtyard shophouses in George Town is one of the heritage buildings that have been well studied to understand their importance in the architectural environmental aspects in terms of ventilation and lighting. Therefore, one of the most famous heritage city in Malaysia is George Town located in the northern part of the Peninsular Malaysia has been added to the UNESCO's world heritage list in 2008, to acknowledge its rich cultural heritage constituted of unique architectural components and cultural townscape. Therefore, one of the most important features of traditional shophouse is the courtyard. Knapp (1999) stated that the interior courtyard houses were typically found in residences throughout China, but their composition and scale were different across the country as presented in Figure 1. In spite of this, architectural and cultural values, recent modern shophouses in Malaysia do not share similar concern and the importance of maintaining the environmental aspects values. Unfortunately, the courtyard of traditional shophouse could not survive its original identity. However, evidence shows that renovation and modernisation of shophouses is a threat to many courtyards that serves many functions which include cultural and place identity environmental benefits

such as heat gains, natural ventilation and lighting among others. In addition, at one time began to install sliding roofs with polycarbonate sheet coverings. Therefore, the effect is that air circulation, natural ventilation is reduced by at least 60 per cent (Tan, 2015). Hence, this research aims to investigate the original environmental aspects of courtyard in terms of natural ventilation and natural lightings components preserved in these shophouses.

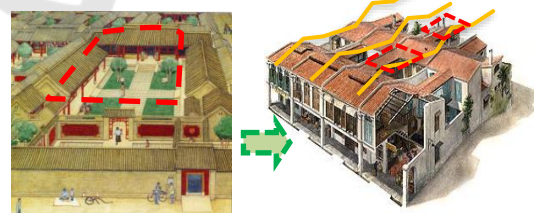


Figure 1: Configuration of China Courtyard House and the Courtyard Shophouses in Penang.

Source: Adapted and Surveyed by Author

2 STRAITS CHINESE SHOPHOUSES

Traditional courtyard shophouses located in the hot-humid climate of Malaysia with the aim of providing useful ventilation and lightings strategies for modern

urban houses. The Traditional Chinese shophouses are deep-plan brick row houses that are located in relatively dense urban areas. In Malaysia, the origin of the Straits Chinese Shophouse can be traced back to the influx of Chinese immigrants from densely populated southern coastal provinces of China in the 19th century until World War II (Chen, 1998). By the early 20th century, this urban design had spread to every major town in Malaysia. The Straits Chinese Shophouse in Malaysia have traditionally been two-storey buildings with the lower floor used for trading and the upper floor used for residential purposes. While in Penang, a shophouses can be a purely residential structure which elsewhere would be called as a terrace house. One of the most important features of Straits Chinese Shophouse is that each building has one or more internal courtyards (Chen, 1998). Moreover, Courtyard houses can be found not only in China and Southeast Asia but also in many other parts of the world (Edwards, Sibley, Land, and Hakmi, 2006). It is considered that the courtyards provide not only natural lighting and ventilation but also offer protection from harsh outdoor conditions (Safarzadeh and Bahadori, 2005). In China, courtyard houses were originally found in residences throughout the country, but their composition and scale varied depending on their location (Knapp, 1999). In general, the proportion of courtyard space to structural space diminishes significantly from Northeast to Southeast China to restrict the infiltration of direct solar radiation and facilitate ventilation (Knapp, 1999). Most of the courtyards in Malaysian Straits Chinese Shophouse are the narrow and deep courtyards that originated from the southern part of China. However, George Town, the capital city of the Malaysian state of Penang, is located at the north-eastern tip of Penang Island. It is Malaysia's second largest city; the historical core of George Town has a tremendous architectural history with approximately 7,000 units of traditional courtyard shophouse in George Town Heritage City. This city was built 200 years ago during different periods (Tan, 2015).

3 ENVIRONMENTAL ASPECTS NATURAL VENTILATION AND NATURAL LIGHTING

The concept of traditional courtyards (Air_Wells) designed to cope with the local tropical climate, the buildings are structured to maximize airflow (Stubbs & Thomson, 2016). Courtyards as the main open space of many dwellings, constituted important

features in residential architecture throughout antiquity in Heritage City George Town. The traditional courtyard shophouses were designed with rooms of various functions surrounding the courtyards and were organised in association with these yards as the life of the occupants evolved around them. The important role played by the courtyard was due to climatic conditions as well as to the of the social parameters area that offered occupants a protected area suitable for outdoor activities throughout the year. Thus, the courtyard always held a special, functional, environmental aspects role within a residence. Reynolds (2002) described that the courtyards as special places that are outside yet almost inside, open to sky, usually in contact with the earth, but surrounded by rooms. Edwards, Sibley, Land, and Hakmi (2006) stated that the natural elements of the courtyard i.e. earth beneath and sky above, ensure its direct contact with nature. This study presents an overall view of all the different ventilation and lighting elements related to the courtyards of traditional architecture found in shohouses underlining their environmental significance.

4 THE SHOPHOUSE COURTYARD CENTRAL

Shophouses courtyard were originally designed to be fully open to the sky in order is similar to the internal courtyards in Southern Chinese architecture. Hence, the concept adapted the local conditions, as the house is long and narrow (Kubota, Zakaria, Abe, and Toe, 2017). Courtyard provides better cross ventilation and natural daylight as presented at Figure 2. The placement of courtyards in the shophouse ensures the present of natural daylight throughout the house. With the aid of operable louvered windows in the courtyard (Air_Well), the rooms in the house have ample air flow while having the control of daylight entering the rooms (Tan, 2015). Other passive ways of ventilation is through the air vents on the façade and the partitions.

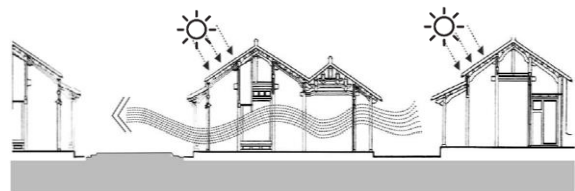


Figure 2: Analysis the Natural Ventilation and Natural Lightning of Shophouse

Source: Adapted and Surveyed by Author

5 METHODOLOGY

This study adopted case studies type of qualitative research to obtain the findings. For the qualitative data collection technique, the study adopted combination of the following; case studies, observation, secondary sources, architectural documentation data, and visualising materials (Creswell, 2013). This was supported by the architectural detail studies on the Late Straits Eclectic Style Heritage Shophouse. However, the paucity of literature in this present study stirred the researchers to concentrate more on the primary source via photo shoots. These photos were subsequently analysed in detailed, which have been missing in past literature in regard to heritage building shophouse regarding architectural original environmental aspects of courtyard. Since the paper focuses on heritage building shophouses, they are crucial to be investigated. Therefore, the researchers conducted this research on three combined shophouses buildings (3, 5, and 7) built in 1926 respectively. This study contributed to the environmental aspects study that reflects the traditional architecture of George Town Heritage City, Penang. This study carried out the sustainability of the architectural natural ventilation and natural lighting.

6 RESULTS AND DISCUSSIONS

The main issue of this paper is to highlight the lack of awareness regarding the significance of the architectural natural ventilation and natural lighting of the traditional courtyard Late Straits Eclectic Style shophouses. The courtyard is identified as one of the main contributors for the conservation and documentation of the heritage components identity. However, according to 44 king street report (2016), the courtyards do come with problems like heavy rain could make the interior wet, even minor flooding when air condition became a popular household electronic device, many owners chose to cover up the courtyards, losing the natural ventilation, as well as the natural lightings, causing the courtyard become dark and damp.

6.1 Cases Studies of the Study 3: Nos. 3, 5 and 7

Nos. 3, 5 and 7 is located in Lorang Ikan along George Town City, Penang. Figure 3 presents the architecture style of the shophouses No.3, 5 and 7 and

could be categorised as Late Straits Eclectic Style based on the design of the façade and Madam Teh a former tenant of the shophouse No.7 and she informed the researcher the Nos. 3, 5 and 7 were built and owned by a Straits Chinese (*Peranakan family*) with the surname Wong since 1926. Certainly, the cases studies of this research are a marvellous example of Straits Settlements. Tye (2016) affirms that the style was popular in George Town traditional shophouses in the early 20th century when the city was experiencing its prosperous era. However, it is easily confused with the Early Straits Eclectic Style as they share similar appearance.



Figure 3: The Façade of the Traditional Courtyard Shophouses No.3, 5, 7. Source: Field Work

The traditional shophouses are categorised as the Late Straits Eclectic Style. This is also supported by the characteristics of the facade as presented in Figure 3. However, the findings of the study shows that a common feature from the Early Straits Eclectic Style – central keystone of the windows arches can be observed at the facade. This agrees with Ahmed (1994) and Tan (2015). The authors mentioned that the shophouses styles could be overlapped with some of the elements in earlier styles remained.

7 NATURAL VENTILATION

As discussed that the natural ventilation is important in the shophouses buildings which have long and narrow forms. The findings show that with effective ventilation in the buildings, excessive moisture and odour could be removed while bringing fresh air into the buildings. Figure 4 shows the cross ventilation across shophouse No.3 and stack ventilation that happens at the air well. These agree with Kubota, et

al. (2017). The authors affirm that shophouses courtyard were originally designed to be fully open to the sky and is similar to the internal courtyards in Southern Chinese architecture. Hence, the concept adapted the local conditions, as the house is long and narrow. From the observation, the study findings show that the raised floors allow fresh air to ventilate underneath and reduce exposure to cold and damp rising up from the ground.

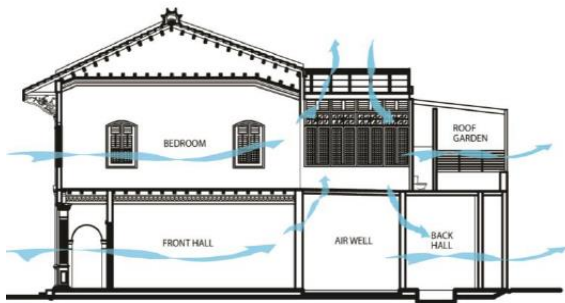


Figure 4: Ventilation Diagram in shophouse No.3 section. Source: Adapted and Surveyed by Author



Figure 5: Potted Plants at the Courtyard of shophouse No.5. Source: Adapted and Surveyed by Author

From the observation as presented in Figure 5 courtyards were utilized as a garden, daylight element, ventilation system and playground, shows that almost all the courtyards are utilized as gardens as well as for daylighting as well as natural air purposes. These open-to-sky spaces may be backyards, small air wells and most commonly, internal courtyards. Depending on their size, these courtyards may be landscaped spaces for quiet reflection, places to dry laundry, vents for cooking fumes or toilet odours or spaces for any number of household activities.

Referring to Figure 5 as presented from Lot No. 5 courtyard, physical observation shows that the courtyard functioned to discharge the rain water from the roof to the sunken well. As water represents wealth in the Chinese belief - 'Feng Shui', the

flowing of rain water into the buildings also symbolises the accumulation of wealth. This findings agree with Zwain and Bahauddin (2017). The authors stated that Chinese strongly believe that water represents 'wealth' and hence they designed drain pipes in a way to force rainwater flowing around the house first before being discharged into the drain outside. This design ensures that wealth (rainwater) will circulate within the house for a long time spent. Some families have also constructed an indoor well to store rainwater, directed from drain pipes. The outlets of these drain pipes were often moulded into interesting fish sculptures. Based on the researchers observation findings disagree with

Zwain and Bahauddin (2017). Authors found that the outlets of drain pipes were often moulded into interesting fish sculptures. Hence, courtyard shows some potted plants at the shophouses No.3, 5 and 7 makes the space greener. Moreover, the first courtyard area also serves as a recreation place where families playing mahjong and cherki (card game in Hokkien) under the void. It leads into the ancestral hall on the ground floor (Elnokaly& Wong, 2015).

8 NATURAL LIGHTING

The researcher observations observe that the courtyard plays an important role in providing the interior with sunlight. Courtyard shutters and windows are the significant elements that illuminate the interior during the day. Without them, the long shophouses have insufficient natural lighting, thus are required to rely heavily on electrical lighting to brighten up the interior. The areas nearby the windows and courtyard received more day light than the others as presented in Figure 6. As well as, the observation results also show that the interdependent relationship between the building and environment is emphasised by the traditional courtyard shophouses in George Town revolving around the area elements. The main building in a courtyard shophouse faces the sun for sufficient lighting and kitchen, toilet, shower, and other facilities are located in the backyard. This findings agree with the perception of statement Kubota et al (2017). Kubota et al (2017). The authors stated that courtyard is used mainly for outdoor work. It also works an important function in providing sunlight and fresh air to the rooms that face it.

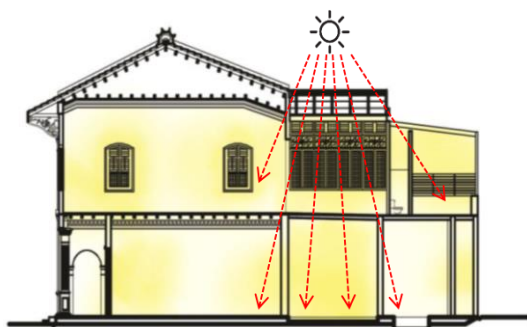


Figure 6: Natural lighting diagram in shophouse No.3 section. Source: Adapted and Surveyed by Author

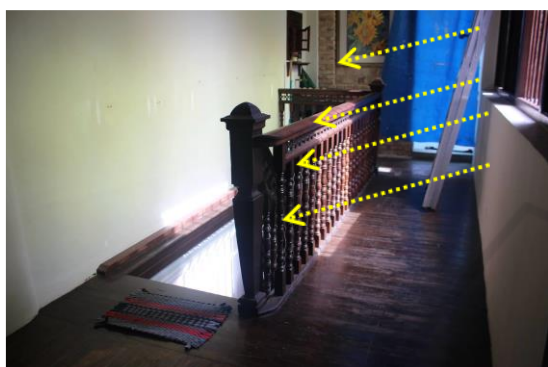


Figure 7: Light Penetrates from the Shutter of Courtyard to the Inside Shophouse. Source: Adapted and Surveyed by Author

As previously presented herein, internal courtyards are effective in securing air flow as well as daylighting particularly in a deep-plan shophouse. It was found that a deep (in height), closed internal courtyard, such as the type shophouse courtyard, is avoiding excessive humidity, even though cross-ventilation would increase indoor air temperature to a certain extent. Therefore, The central design concept in the shophouse architecture in providing proper ventilation and lightening as presented in Figure 7, especially for the tropical climate. That has been achieved through several elements and techniques within the whole design of the shophouse building.

The courtyard and its location, as shophouse got one or in some cases have two courtyards that are to increase its efficiency as well as could help to conduct more than one function in same time. The open space system is also a pivotal design strategy to achieve the active ventilation and better daylighting inside the shophouse. Thus, all these factors are auto-integrated within the building process to form a unified relation between the natural ventilation and natural lightings system and all other systems in the courtyard shophouse architecture.

9 CONCLUSION

The investigation of traditional courtyard shophouses underlines the great significance and the environmental contribution of the central courtyard. The courtyard plays an important role in vernacular architecture of Heritage city George Town, as it forms the main channel of natural lighting to the indoor spaces of the building. Courtyard houses are described by adaptability to the local climatic conditions. The existence of courtyards allows the integration of a series of passive design principles and thus ensures the optimal building's thermal performance approaching conditions closer to human comfort conditions. Courtyard shophouses cease to be passive receptors of the climatic conditions but are designed so as to function efficiently with the different environmental conditions. In this way, the sun and the wind are considered positive elements, defining the geometry and the overall composition of the shophouses. However, the traditional shophouses No.3, 5, 7 in Penang, which has been presented in this paper, were converted into a boutique hotel shophouses in the heritage area of George Town, Penang. One can find the original features architectural identity opening and decorative elements of the shophouse in these buildings. It would be great if the appropriate government agencies and non-government organisation would pay more attention to these old shophouses around George Town Heritage City, this is with a view to sustaining the traditional shophouses components. The resultant effect of this would be sustainability of the cultural and place identity for the next generation. Therefore, the maintenance of the cultural identity of the George Town Heritage City is pertinent. Thus, cannot be over-emphasised. It is important that care and sensitivity should be exercised in repairing existing openings as well as in designing new ones.

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