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Some Typical Problems in the Design of Private House in Vietnam from the Perspective of Tropical Passive Design

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Some Typical Problems in the Design of Private House in Vietnam from the Perspective of Tropical Passive Design

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Abstract

Houses are the most intimate, use the most time of a type of building, so houses design is extremely important work. Especially in the tropics, the high-temperature environment on people's lives have a huge impact, is necessary to have a reasonable design so that the building can adapt better to the climate environment. However, research in some areas in Vietnam is not well done. At present, the user's thermal comfort is not well considered in most of the Vietnamese residential buildings design. This study is aims to answer most common problems: Unreasonable residential area planning: dense combination form led to poor lighting and ventilation conditions; unreasonable building exterior design: the common exterior of the building is a single layer or lack of shading measures of the wall or roof, under the impact of strong solar radiation, its surface is heated, a lot of heat into the room led to indoor temperature is too high; too closed building design: common houses design is a combination of multiple separate rooms, with poor indoor ventilation, the accumulation of heat caused the room has been in a high-temperature state. The study following these outcomes: including the use of a loose type of the layout of the residential area to enhance the building lighting and ventilation conditions; using double roof and double wall to reduce the heating; furthermore, increase the degree of open of the building for effective indoor ventilation. These approaches may support in creating a better living environment for the local people.

Keywords: Natural ventilation, Passive design, Private house, Thermal insulation, Tropical house.

Introduction

The original purpose of the building was to reduce the impact of weather. Palaeolithic, tools behind, intellectually limited, primitive people can only live in natural caves or dwelling in the trees. Later, people gradually use simple natural materials such as clods, stones, branches to imitate natural hidden objects for the ground residence such as reported in the Indian tents, Scottish honeycomb house, which became early human construction[1]. After a long process of development, the rise of human life needs, the progress of science and technology, the Change of Artistic Conception and much more promoted the progress of architecture. So far, the world has been seen a wide complexity of architectural features, technology, and art. However, the original purpose of building construction, that is, to reduce the impact of climate on people, is always the most important concerns, especially in the context of deteriorating climatic environment. Therefore, scholars from all over the world continuously put in the effort to reduce energy consumption, pollution, improve the living environment, and alleviate the deterioration of climate. Therefore, the passive architectural design has become a hot topic of discussion.

Many countries in the passive architecture design have been in-depth theoretical and practical research results, research time is also earlier, involving a very large diverse field, the evaluation standards are relatively perfect, and the research results are very abundant. However, some countries, like Vietnam, due to its own economic conditions, scientific and technological level and other restrictions, led to passive building design has not received appropriate attention, and research and practice in the field of design are relatively limited.

Each climatic region on the earth has different climatic characteristics. Therefore, the methods and measures to be adapted to the climate are different. Each climate type has a huge impact on human life, but, the biggest impact of the tropical climate on people is that the air temperature is too high, Vietnam is a typical case. Vietnam's climate is tropical monsoon climate[2], the extreme temperature of the summer season in the region makes the comfort of people lower, which is a huge challenge for passive building design.

Based on the previous research, the paper introduces the region’s most common, regional characteristic of the private residential building type, standing on the perspective of passive tropical design, finds out the existing problems to develop the corresponding improvement in the study area.

[1]Liu, X. J. and Wang, X. X. 2010. *A Brief History of World Architecture*. China Architecture & Building Press, Beijing.

[2]Ministry of Construction of the Socialist Republic of Vietnam. 2009. *Vietnam Building Code: Natural Physical & Climatic Data for Construction*. Ministry of Construction of the Socialist Republic of Vietnam, Hanoi.

The Characteristics of Private House in Vietnam

The Relationship between Land Policy and Architectural Form

The comprehensive understanding of the characteristics of the private house, first of all, we need to know more about land management policy in Vietnam, mainly the change of land ownership during the different period of times. Land ownership has a great influence on people's living patterns, and the type of residential building and its characteristics were differences because of the different ownership.

In feudal times, there are three kinds of land ownership including state ownership, local ownership, and private ownership[3]. The publicity of the first two is very strong, so the publicity of the construction on these lands is also strong, such as the palace, tribunal, public warehouses, etc., and most constructions on private land are private residential buildings. After thousands of years of feudal times, the private house has become the leading type of building; Vietnamese have become accustomed to this way of living.

In 1945 the Vietnamese feudal era ended, the Democratic Republic of Vietnam was established, turned to communism. During the period of 1945 - 1986, under the idea of communism, the Vietnamese leadership attaches great importance to state ownership, and weaken private ownership, and to implement the policy of the unified administration of land by the Government. The Government built some of the collective residential buildings and assigned to the people. This time, the Vietnamese began to recognize the notion of collective housing.

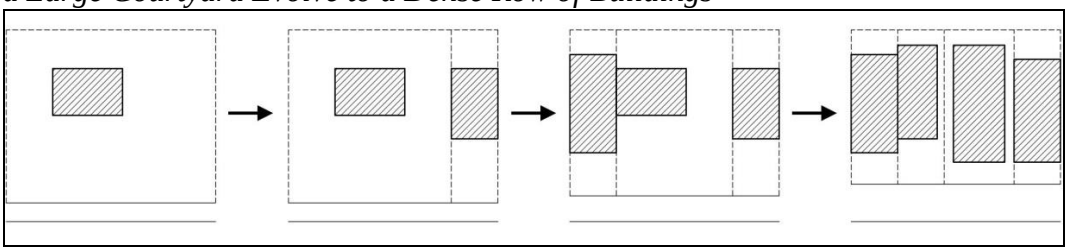
However, due to the limited strength of the government, the number of collective housing built cannot meet the needs of the people of the whole country. With the increase in urban population, residential demand has become increasingly large, beyond the government's control. It can be seen that the housing problem has become a very pressing problem.

In early 1986, the Vietnamese government allowed people to carry out maintenance or build the new house, to solve their own needs, people began to move from the crowded city center to the urban suburbs and build their own a large number of house buildings[4]. The traditional private house is one of the most used types in Vietnam, so at this stage, its architectural type still dominates. With the rapid growth of the population and high demand for new housing; as a result, residential land in urban and suburban areas has been subdivided by inheritance or transfer. There is reduced of land area for each household as presented in (Figure 1). This phenomenon has always existed and evolved to form a dense, small area, tube type of residential type are becoming a popular residential building.

[3]Dang, T. P. 2014. Vietnam's land tenure in history and today. *Vietnam Social Sciences*. 85, 12 (Dec. 2014), 79-86. DOI= https://bit.ly/2MM8tbf.

[4]Trinh, D. L. and Nguyen, Q. V., 1998. *Economic and Social Impact of Innovation in the Field of Urban Housing*. Social Sciences Publishing House, Hanoi.

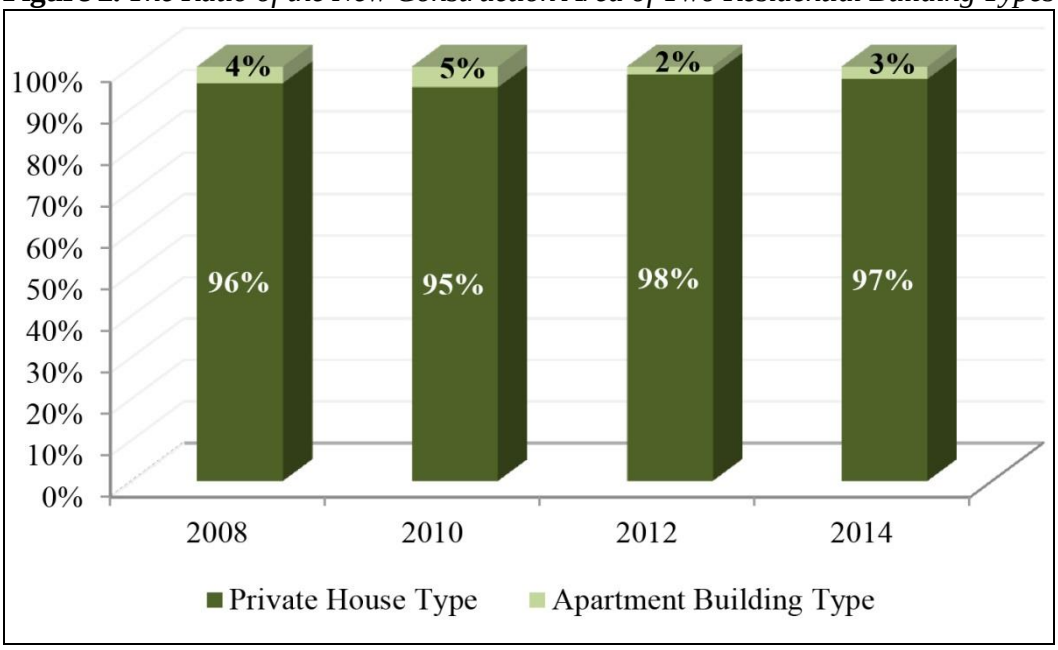
Figure 1. *The Change of House Land: From an Independent Building Situated in a Large Courtyard Evolve to a Dense Row of Buildings*



Today's Residential Area Planning and Architectural Features

A few periods later, most of the urban residential buildings in Vietnam are a private house. In recent times, data from General Statistics Office of Viet Nam shows that each year a new construction area of the private house occupies the vast majority of the new construction area of all residential building. It often occupies more than 95% of the ratio (Figure 2). According to the recent report in 2014, demonstrates new construction area of the private house in Vietnam was 87,517,000m^2, while the new construction area of the apartment building is only 2,326,000m^2. This is a very large gap and is proof of the dominance of the private house.

Figure 2. *The Ratio of the New Construction Area of Two Residential Building Types*



Data Source: General Statistics Office of Viet Nam.

In this study, the term of the private house means the villa residential building type. Common dimensions of each private house: Building height is generally below 5 stories, the building covers an area of about 100m^2 (frontages width of about 5m, depth of about 20m), building area is generally within 100-500m^2.

Architectural design and construction: Small-scale private house (construction area below 250m^2) can be designed by the owner of the house; large-scale private

house (construction area larger than or equal to 250m^2) needs a professional designer to design. The style of the house is decided by the owner of the house in most cases. The construction of the building is mainly carried out by a small construction team. Most of the construction team is mainly based on personal experience and a lack of in-depth guidance of professional knowledge. At present, the government of Viet Nam has set up some regulations on the design and construction of private houses, but it's not very detailed.

Residential Area Planning: Private houses combined together to form a long row; each housing unit at the end of each row has two frontages, each housing unit in each row has only one frontage, and the back of each housing unit is a narrow fire escape; residential planning is usually based on the neat rectangular grid layout, the partitioning of other shapes occurs when the shape of the site is constrained (Figures 3 and 4).

Figure 3. *Common Residential Layout*

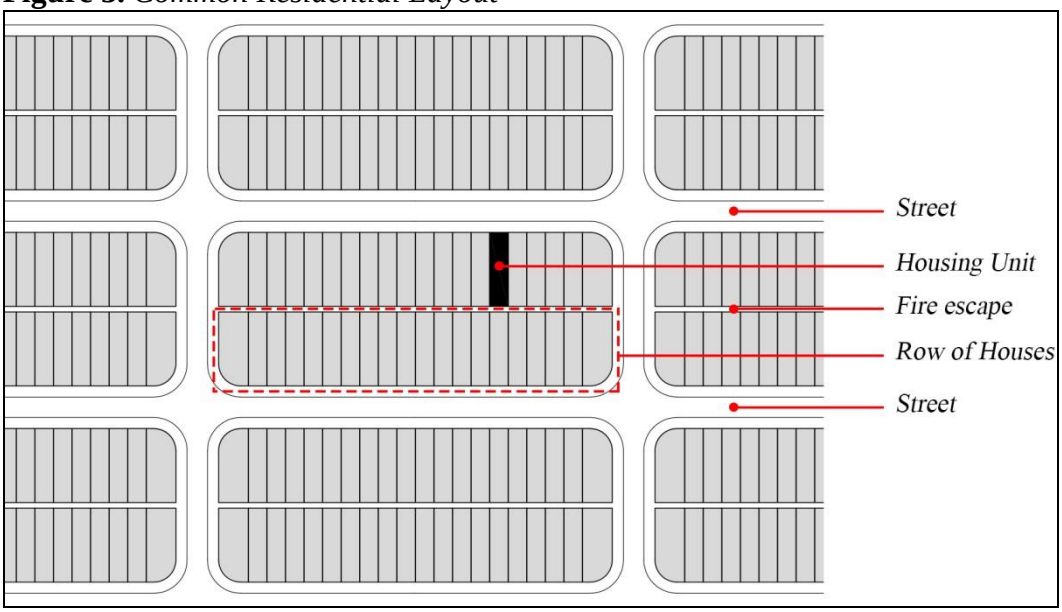


Figure 4. *A Common Perspective of a Row House*

Typical Problems

If we stand in the tropical passive building design point of view, Vietnam's various cities in the private residential design there are still many problems, thereinto, this paper selects some typically, commonly and basically problems to explain, as follows:

High-density of Residential Area Planning

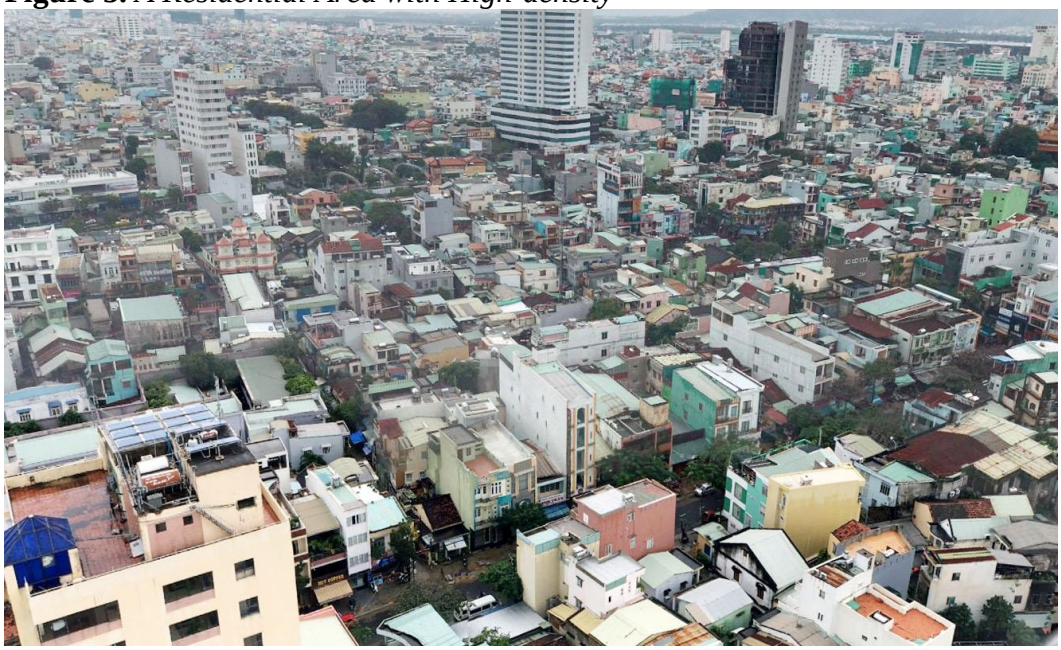
Vietnam is in a humid tropical climate, with high-temperature and large humidity. In its environment, the ventilation effect has a tremendous impact on human thermal comfort; good ventilation can make people feel comfortable, poor ventilation effect will lead to the building room is too hot, comfort is reduced. Therefore, in the residential planning stage, the designer should fully consider the ventilation problem. But at the present time, the majority of residential planning did not get the appropriate attention. The excessive density of building (with little space between rows and rows, the distance between the two rows of buildings is about 9m, the distance from the back of the two row is about 1.5m) is one of the unreasonable methods (Figure 5). The disadvantage of these outcomes is reflected in the following points:

First of all, the wind in the high-density residential area is mainly on the road, the direction of the wind is perpendicular to the entrance of the house, so it is difficult to enter the house indoor. Since the house doors and windows cannot be located on two long elevations, they can only be arranged on two small elevations. Therefore, the air inlet and outlet area are small, the wind speed in the house indoor is small and the ventilation time is long.

Second, it is precise because the buildings are close together, so the natural lighting conditions of the building have similar problems. The frontage of the building is small, resulting in a small lighting area and uneven distribution of light, mainly concentrated in both ends of the house, while the middle part of the house lighting conditions is poor. In the vertical direction, the lower stories of lighting conditions are not as good as the above stories.

Third, in the tropics, vegetation has a good effect on regulating the climate of urban space, but the greening rate in the private residential areas of various cities in Vietnam is quite low or even without green space. In most cases, the trees on both sides of the street are the only elements that regulate the climate, no more green areas. In every single site, there is a lack of rigid requirements for building the green space or policy of encouraging build the green space, so people generally try to make the building filled the venue. These lead to increased temperature in the residential area.

Figure 5. *A Residential Area with High-density*



Unreasonable House Exterior Design

Solar radiation has a great impact, especially in tropical climates. Under its effect, building exterior surfaces temperature were dramatically increased and passed into the building indoor. Vietnam is the region that has an extremely obvious to such issues. In order to understand this situation clearly, we proposed to select three houses in Danang city, Vietnam, as examples and measured the surface temperature and the indoor air temperature of these houses.

In July 2016 we conducted a very wide inspection in project area which mainly includes: The house on Tran Quy Khoach Road (A House), the house on Nguyen Van Giap Road (B House), and the house on Trinh Cong Son Road (C House), overall study sample were collected during the 6am to 9pm, where the weather conditions are sunny based on the study design, and the minimum and maximum

outdoor air temperatures were: A House: 26°C & 36°C, B House: 27°C & 36°C and C House: 28°C & 37°C.

The surveillance was done using the measurement tools such as: Infrared Thermometer Smart Sensor AS852B, measuring range from -50°C to 750°C, with measuring accuracy ±2°C (at 0°C to 100°C environment), resolution 0.1°C, Emissivity adjustments were 0.90 (when measuring brick and tile) and 0.95 (when measuring concrete); Air Thermometer Suwei SW101, measuring range from -10°C to 50°C, measuring accuracy ±1°C, and resolution 0.1 °C.

Roof measurement outcome: In the A House, above the reinforced concrete roof, there is no other shielding device, so under the effect of solar radiation the process was followed by the heat of the roof, where the lowest roof interior surface temperature was 34.3°C, and the highest degree was 44.5°C. A large amount of heat directly transferred into the indoor space; the indoor air temperature rapidly increases, the air temperature of the floor space about 35 ~ 36°C (Figure 6). With the same principle, the reinforced concrete roof of the B House was influenced by solar radiation. However, because in B House we installed shade net, the influence has been reduced. Since the radiation intensity was lower reported. However, the temperature of the roof becomes lower than A House. The lowest interior surface temperature of the roof was 30.1°C, the highest was 37.4°C, the air temperature of the second floor was about 32 ~ 33°C (Figure 7). The roof structure of the C House is different from the previous two cases. The C House is designed with a tile roof system, which shielding was almost the below reinforced concrete roof, forming a buffer space to minimize the effects of solar radiation. Under the sun, the tile roof appears with a very high temperature, the lowest interior surface temperature of a tile roof was 39.5°C, the highest was 55.5°C, and the air temperature of the space below tile roof at noon time is over 37°C. However, due to the shielding of the tile roof, while the hot air in the roof is also often pushed out by the wind, the reinforced concrete roof has a lower temperature than the two cases A House and B House, the lowest interior surface temperature of reinforced concrete roof was 31.5°C, the highest was only 34.8°C, and the air temperature on the second floor was only 31 ~ 32°C (Figure 8).

Comparison of the above three results can be easily seen, with relatively homogeneous environmental conditions, uncovered roofs, partially sun shaded roofs, and completely sun shaded roofs, the degree of heat received by the houses is different. The roof without a sun shading system was heated quickly, and the heat always exhaled directly into the house interior during the day. At night, reinforced concrete roofs continue to emit a large amount of heat, causing the high interior air temperature.

Figure 6. *The Temperature Measurement Results of a House*

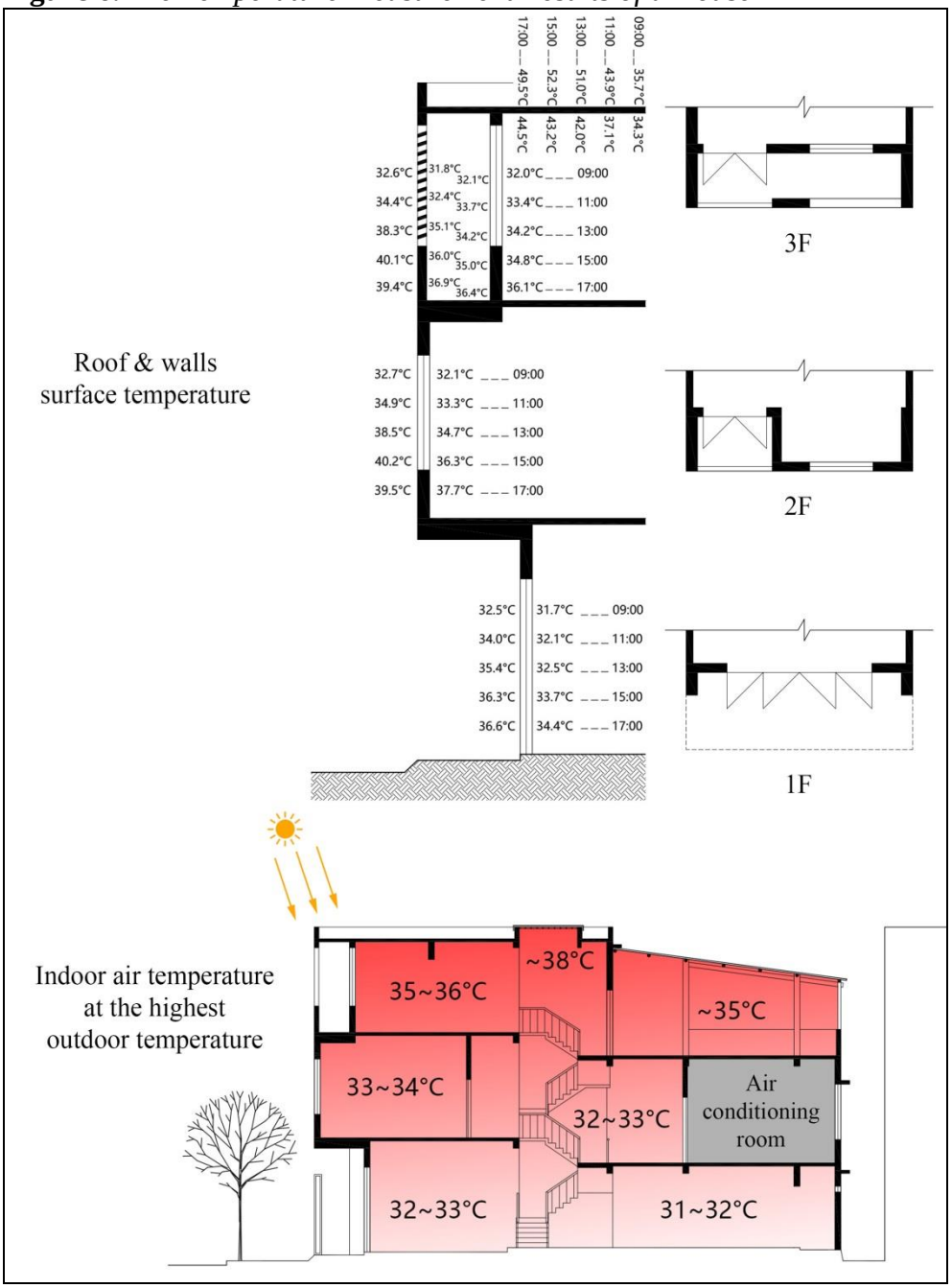


Figure 7. *The Temperature Measurement Results of B House*

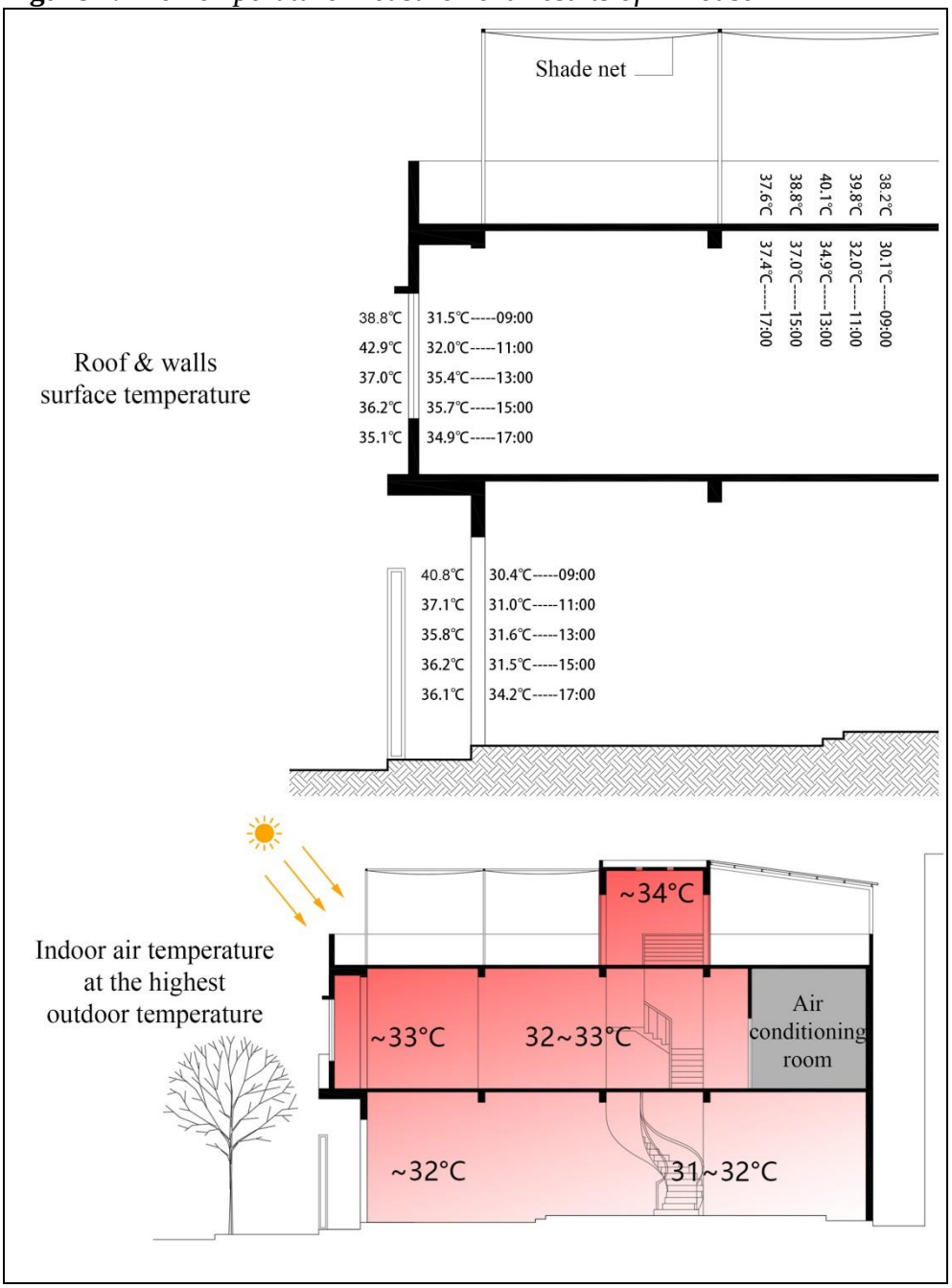
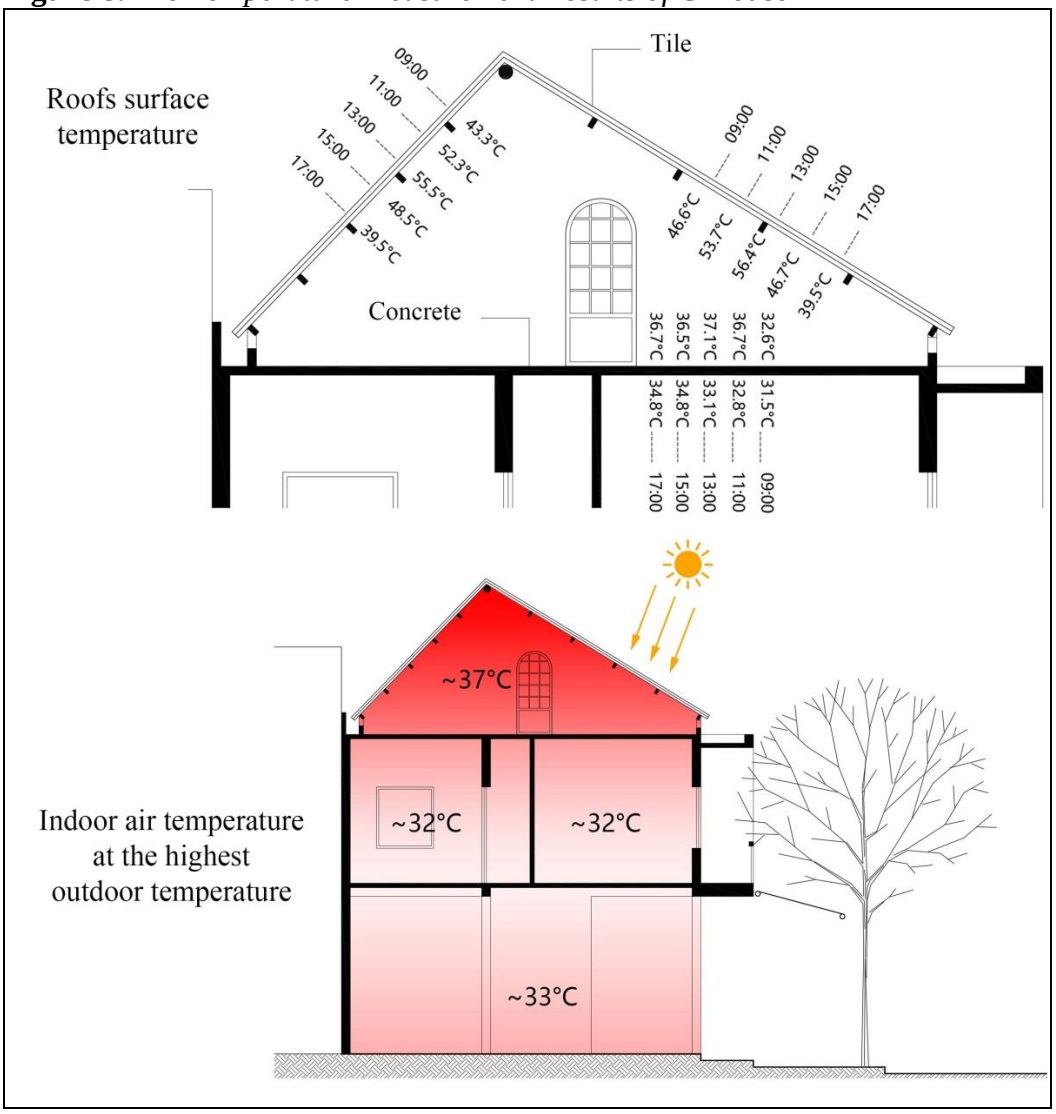


Figure 8. *The Temperature Measurement Results of C House*



Results of the wall measurement: Measurements of wall surface temperature was also showed similar phenomena to the roof. Under the effect of solar radiation, the outer walls of the houses are heated and continuously transmit the heat to the interior space. Walls on the 2nd floor of A House and B House have no sun protection led to high temperature of the walls. The interior surface temperature of the walls respectively was 32.1 ~ 37.7°C (A House) and 31.5 ~ 35.7°C (B House). In A House, a small part of the interior wall of the 3rd floor was covered by an outer wall, so the interior surface temperature of the interior wall was 32.0 ~ 36.1°C, lower than the wall of the second floor. In the houses A and B, a large part of the wall are covered by trees, so the interior surface temperature of walls was in the range of 31.7 ~ 34.4°C (A House) and 30.4 ~ 34.2°C (B House), which was lower than the wall of the second floor. The results show that unshielded walls will have a higher temperature, and the amount of heat entering the house will also be higher than the sun-shaded walls.

The actual measurement results are shown that a single layer of roofs and walls exposed to direct sunlight has very poor heat insulation in the Vietnam area. We all know that, the roof solar radiation absorption rate can reach 95%[5], showing that the roof is the building to get the most heat of the part, and the wall has a similar situation. If we have no suitable roof and wall construction method, the building will be subjected to a lot of heat generated by solar radiation. But, at present, the most common roof construction in Vietnam has divided in to the two main kinds: single layer reinforced concrete roofing and single layer metal corrugated board roof. The principal problem with these two roof construction is that the roof is too thin. The heat generated by solar radiation is well passed through the roof into the house indoor, resulting in a rapid increase in indoor temperature. The wall design also has a similar problem. The wall itself often has no sun shade, the design of sun shading measures for doors and windows has not been properly calculated, even just a decorative component. Single layer, non-shading measures of the wall directly exposed to the sun is unable to resist the high temperature. The daytime, ordinary single brick walls are constantly heated, and the house indoor air is also heated. At night, when the wall is still generating heat, the indoor temperature has been in a high temperature state.

Too Closed Building

Due to the designer and/or the user, there was a lack of attention and/or lack of basic knowledge of natural ventilation in tropical areas, emergence too closed building. In order to further study the ventilation problems in Vietnam, this study continues to measure and analyse the wind speed in A House, B House, and C House. Measurement tool: Anemograph Smart Sensor AS8336, with measuring range from 0.1m/s to 45m/s, measuring accuracy ±3%, resolution 0.001m/s.

A House: The maximum outdoor wind speed in the main wind direction is 2.76m/s. When there is wind, and when the doors are open, the average wind speed in the house is about 0.75m/s in the third floor, about 0.30m/s in the second floor, and <0.10m/s at the inside of the first floor (Figure 9).

B House: The maximum outdoor wind speed in the main wind direction is 3.58m/s. When there is wind, and when the doors are open, the average wind speed in the house is about 0.30m/s in the second floor, and 0.28m/s in the first floor (Figure 10).

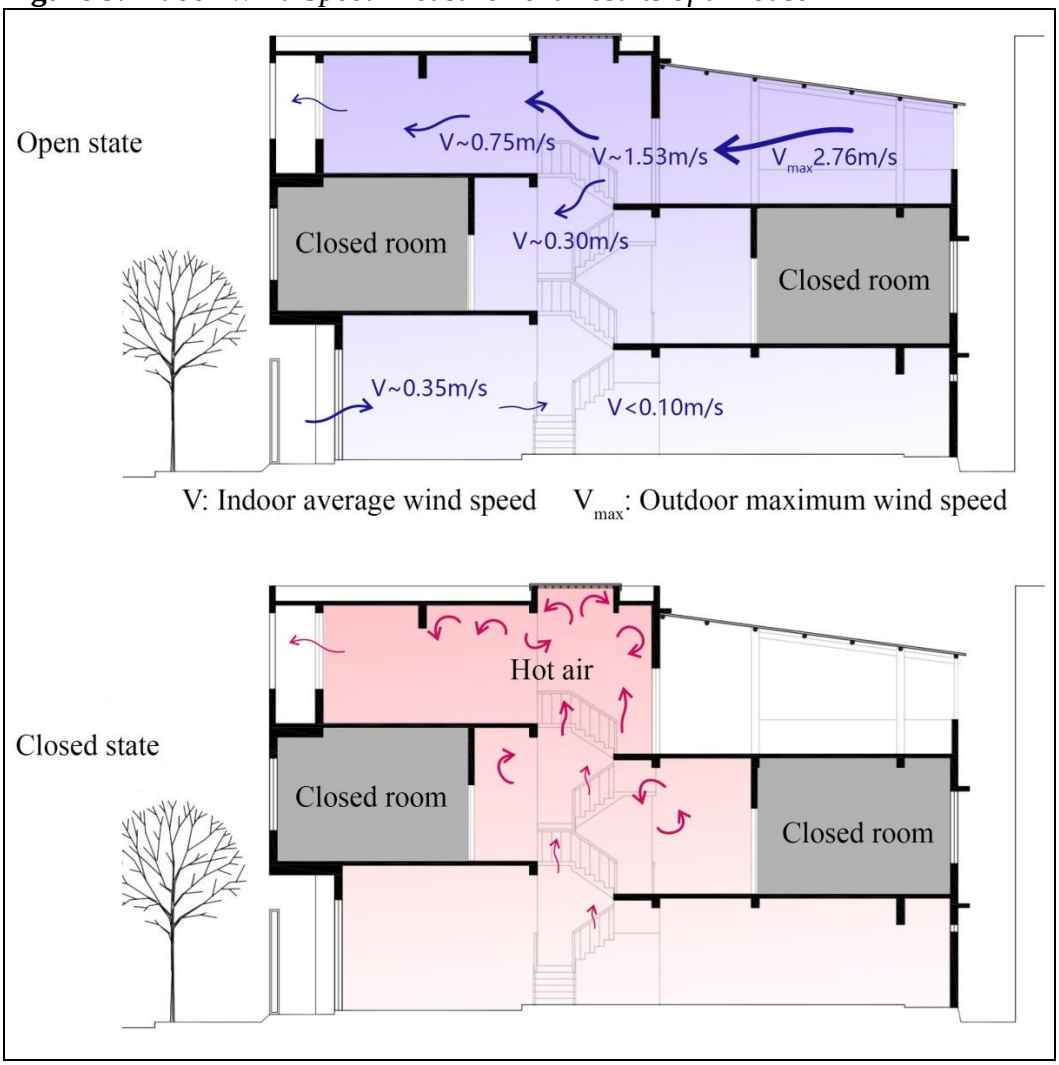
C House: The maximum outdoor wind speed in the main wind direction is 1.86m/s. When there is wind, and when the doors are open, the average wind speed in the house is about 0.32m/s at the inside of the first floor, and about 0.36~0.37m/s in the open spaces of the second floor (Figure 11).

Measured data showed that, when there is wind, and when the doors are open, the average wind speed of the majority of open spaces is 0.28m/s to 0.37m/s, people can feel the wind, and have the feeling of cooling. However, there is also relatively closed space (such as bedrooms, areas within the first floor with no doors or very

[5]Suehrcke, H., Peterson, E. L. and Selby, N. 2008. Effect of roof solar reflectance on the building heat gain in a hot climate. Energy and Buildings. 40, 12 (2008), 2224-2235. DOI= https://doi.org/10.1016/j.enbuild.2008.06.015.

small doors) with a wind speed of less than 0.10m/s and very low wind frequencies. Its wind speed does not guarantee the circulation of air and does not create the effect of cooling on humans[6].

Figure 9. *Indoor Wind Speed Measurement Results of a House*



[6]Ngo T. 2012. *Building: Energy & Environment*. Construction Publishing House, Hanoi.

Figure 10. *Indoor Wind Speed Measurement Results of B House*

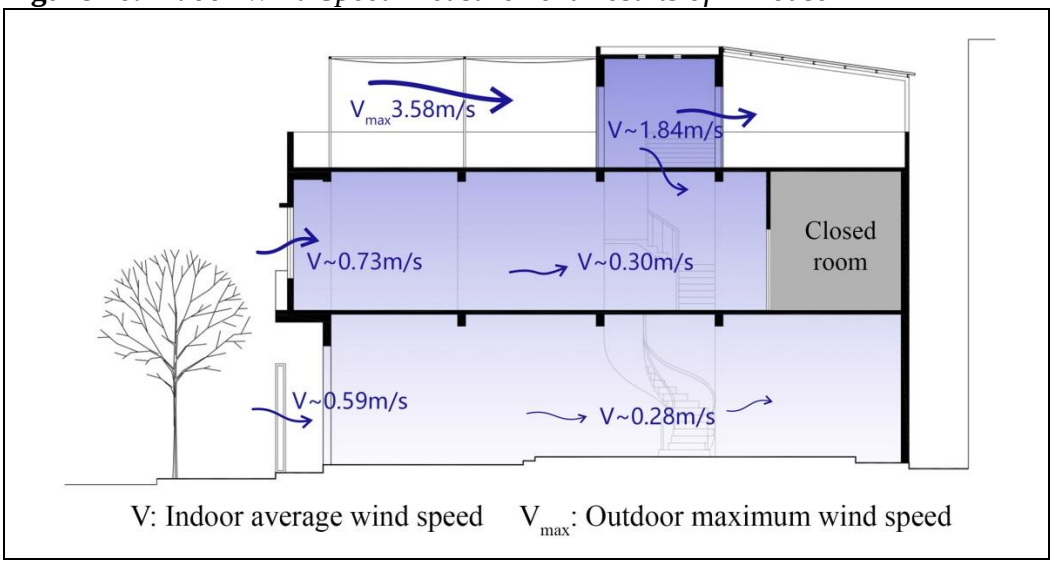
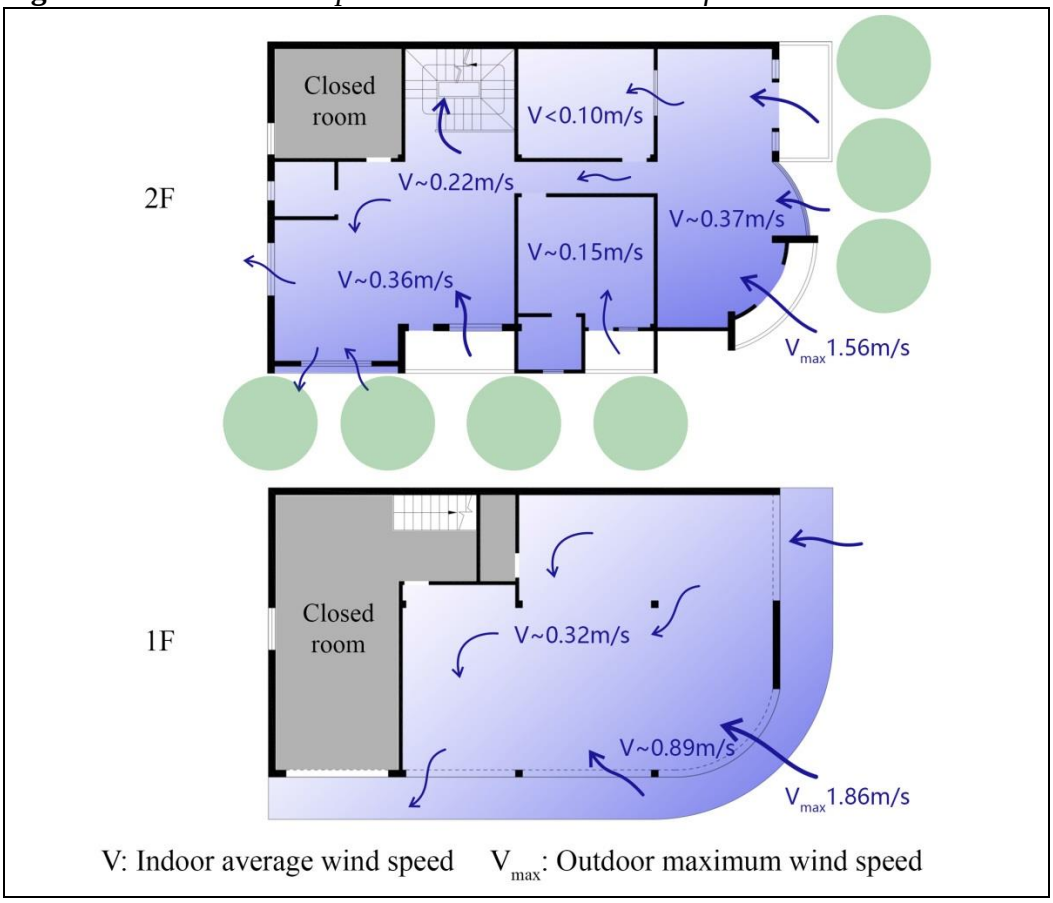


Figure 11. *Indoor Wind Speed Measurement Results of C House*



In 3 cases, only C House opening a long time with two opening facades, so C House has a good indoor ventilation environment, although the outdoor wind speed is lower than the other two cases. The other two cases have the small area of windward

facades, and that the doors often closed, so the ventilation efficiency was very low, especially in the case of A House. A House which has a courtyard in the middle, but the designer not uses sunshade measures, so sunlight directly into the indoor space led to high indoor temperature. On the other hand, due to anti-theft requirements, the back door of the first floor cannot be opened, and the window was very small in size (0.4x0.2m). Consequently, the ventilation effect was very weakly reported. There is a little air feeling (about 0.1m/s) when the outdoor wind speed is large, and the anemometer cannot measure wind speed when the outdoor wind speed is small. Two ends of the second floor are two bedrooms and are often closed, cannot form a horizontal ventilation effect. On the third floor, the outdoor ventilation condition was reported very well. For the reason that the maintenance structure of the washing room is a steel wire net, so the outdoor wind can be easily entered into the washing room (according to record, the air speed in the washing room can reach 2.76m/s). When the partition door between the washing room and the inner room is opened, the wind speed at its door position can reach 1.53m/s, and the average indoor wind speed of the third floor can reach 0.75m/s. But unfortunately, like the anti-theft requirements, the doors and windows are always closed, at this time, the good ventilation conditions described above are completely lost.

From the above analysis, we can see the hot air accumulated led to the air temperature in the house is always high when space too closed. Although the problem is obvious, most private residences are relatively low in openness (similar to A House), reflected in the following two points:

The exterior of the house is too closed: The common phenomenon is that the doors and windows on the facade of the house are too small, or often closed (Figure 12), some houses even use closed facades and rely on other energy consuming ways to solve its problems.

The interior of the house is too closed: House interior space is generally composed of a number of the independent room; separate measures generally use dense brick walls. There are not many holes in walls, mainly some tiny room door but also often closed, leading to poor indoor ventilation conditions.

These design habits have become a common phenomenon, causing a lot of building ventilation problems. It is a reflection of the poor ability of the adaption to the climate of the building.

Figure 12. *The Too Closed Facade of One House in Danang City, Vietnam*

Strategies for Improvement

The above content has described some typical problems of private house design in Vietnam. Based on these problems, this paper discusses the following strategies:

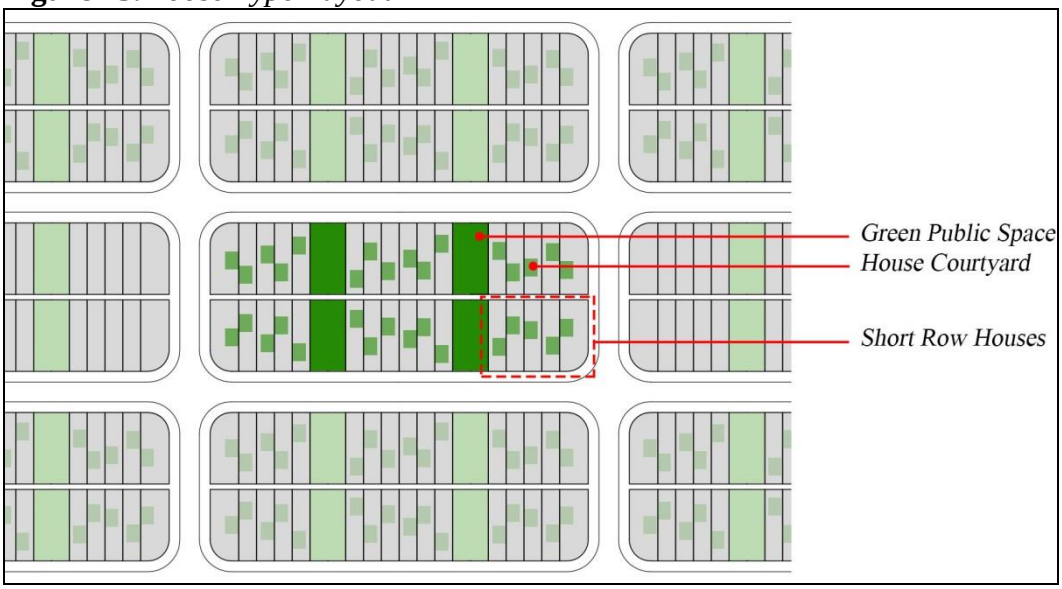
Using Loose Type of the Residential Areas Layout

At present, the form of private house area planning in Vietnam comes from the evolution of urban history. It is closely related to local economic, social and technical level, but also people have been accustomed to this mode of residence. Therefore, it is more difficult to propose a new planning method, need to have more depth and comprehensive research. This paper attempts only discuss to mitigate their disadvantages of the current design.

The local planning department should consider reducing the building density; use more loose layouts to enhance ventilation and lighting conditions. The method is: we need to break the common long row houses into a number of short row houses in private house area planning. In other words is to sacrifice some of the construction sites to get more directly facing the outdoor facade area, so that more houses get better ventilation and lighting conditions. The space between these short row houses can be used as a community of public activity space to solve the current lack of public activity space (Figure 13).

In addition, because of urban green space mitigates the urban heat island and provides cooler microclimates. Therefore, it is necessary to consider the design of the above public areas into green space, enhance the greening rate of residential areas, to provide shade and comfortable place for residents. In each building site also needs to have a suitable green area. The green space can be a courtyard before and after the building, or the patio within the building combined with the courtyard. The government should establish appropriate regulations and encouragement policies; let residents understand the importance of green space for building comfort enhancement.

Figure 13. *Loose Type Layout*



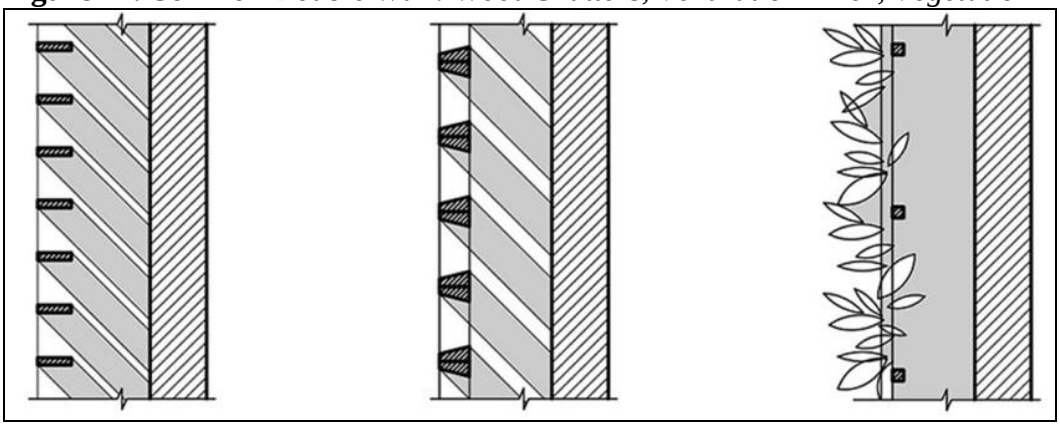
Using Double Roof and Double Wall

The basic goal of passive thermal insulation on the roof is to reduce the amount of heat generated by solar radiation through the roof into the interior space. In order to achieve this goal, the roof construction design should adopt multi-layer roof construction (double roof) with its own sunshade and heat dissipation function. In its construction, the outer roof layer shade on the inner roof layer. Under the impact of solar radiation, the outer roof layer is heated, so that the air between the two roof layers is also heated. But in windy conditions, most of the hot air is released into the outdoor environment, only a fraction of the heat through the inner roof layer and into the house interior. Therefore, the double roof construction has better insulation effect. The material on the outer roof layer can be a common, easy to operate and maintain materials, such as reinforced concrete slab, corrugated metal board, wood board and vegetation layer (Figure 14).

Passive thermal insulation methods of walls are coping with the impact of solar radiation on house elevation. Designers are required to combine multiple strategies to achieve better thermal insulation effects. Consider the appropriate layout of the house from different solar radiation received by different elevations; the core strategy is to reduce the hot elevation area through the design of house forms and the use of surrounding houses. And the same principle of roof design, in the hot, humid areas

more effective wall insulation method is the use of the double wall. In its construction, the outer wall layer shade on the inner wall layer, the air layer between its two layers acts as a thermal dissipation layer. The designer should not only ensure that the shade effect but also to ensure ventilation, therefore, consider the use of local common, air-permeable materials such as wood shutters, ventilation brick, vegetation, etc. as the outer wall layer of the material.

Figure 14. *Common Double Wall: Wood Shutters, Ventilation Brick, Vegetation*



In short, the core design strategy for roofs and walls is as much as possible on the main roof or wall to form a shadow area to reduce the temperature. This study carried out a simple measurement to further illustrate the effectiveness approach. On the same side of the roof, measured the surface temperature of exposed part and covered part of the roof. The results show that, when the temperature of the exposed part is 45.3°C, the temperature of the covered part is 39.8°C, it is 5.5°C lower than the former. On the same side of the wall, measured the surface temperature of exposed part and covered part of the wall. The results show that, when the temperature of the exposed part is 39.2°C, the temperature of the covered part is 35.1°C, it is 4.1°C lower than the former. It can be seen that if the roof and the wall have their own shade performance can form a better heat effect.

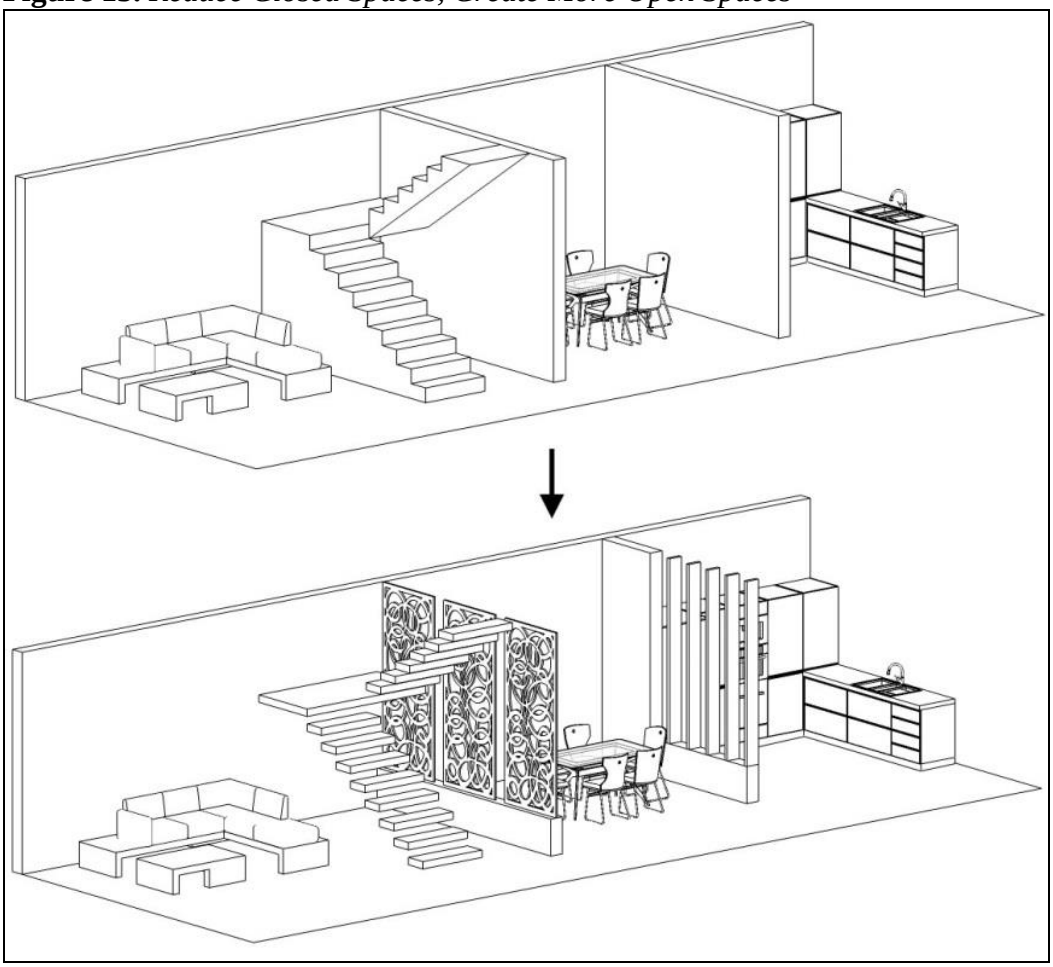
In addition, the sun shading strategy of the doors and windows on the house elevations is also extremely important. The basic function of a shading device is to intercept the sun's rays before reaching the building interior during the heating season[7]. Sun shading of doors and windows also requires different shading modes according to different orientations, and pay special attention to the sun path, the solar altitude angle and azimuth angle, so as to determine the required form and size of the sun shading components.

[7]Kim G., Lim H. S., Lim T. S., et al. 2012. Comparative advantage of an exterior shading device in thermal performance for residential buildings. *Energy and Buildings*. 46 (Mar. 2012), 105-111. DOI= https://doi.org/10.1016/j.enbuild.2011.10.040.

Increase the Degree of Open of the Building

In passive cooling strategy in tropical area, minimizing the heat load of the sun is the first important work. The second one is made of the natural ventilation maximum[8]. Therefore, in the horizontal direction, it is necessary to ensure that the outdoor natural wind can enter the room smoothly to enhance the ventilation effect; in the vertical direction should be considered to arrange the patio, because the patio can be light, air, rain, vegetation and other natural factors into the house interior and regulate the microclimate of the house[9].

Figure 15. *Reduce Closed Spaces, Create More Open Spaces*



An ideal ventilation condition for the tube house interior space is without walls (Figure 15), at this time, the designer can limit the space through furniture layout, difference height of the ground, difference color of the ground and wall. When there must be a partition, the air-permeable partition should be used instead of the dense

[8]Song, Q. 2015. *A Research on the Basic Theory and Method of Passive Building*. Doctoral Thesis. Xi`an University of Architecture and Technology.
[9]Chen, X. Y., Zheng, B., Hou, H. M. et al. 2012. *Building Design and Natural Ventilation*. China Electric Power Press, Beijing.

wall. That creates a visual relationship between open spaces to improve ventilation effect. In private spaces, it can be arranged on the wall of a large area of shutters. The shutters can block the sight line interference and allow the air to flow. Behind the shutters layer, can be arranged another sound insulation measure. If necessary, it can block the sound interference when it is closed. From another point of view, reduce closed spaces, create more open spaces, is returning the Vietnamese traditional space property.

Discussion

From residential area planning perspective, loose layout in practice also encountered some difficulties. Loose layout requires a larger land area, more public facilities, so for local governments and developers, aims to improve costs, reduce profits of the action. Of course, developers do not need it, because their purpose is often to maximize the income, and local governments also need to have higher financial revenue. There is another difficulty, government, developers and residential users they do not have enough knowledge. Furthermore, they are not paying importance attention to the green public space which led to crowded, sultry and lack of interactive residential areas become a common phenomenon. If we want to solve these two obstacles, we need to have reasonable macro policies to adjust. The government wants to be a pioneer, firmly establish a comfortable residential area as the primary objective of residential design, and appropriately reduce fiscal revenue to create a better living environment. Economic gains may be detrimental, but to society, it may bring more benefits than money can measure. Government officials, planning staff, should pay attention to the importance of green public space, and promote it to developers and residential users in order to promote society's understanding of it. The government should improve the relevant norms of residential planning, and to ensure the effective implementation of the norms in practice to guide the land and the residential market to sustainable development.

In the architectural design point of view, in addition to contemporary research, today we can still carry out many designs of the buildings to adapt to climate experience from the traditional architecture. Vietnam's traditional architecture, especially the ancient buildings of Hoi An Ancient Town, have a strong historical and local character. The form characteristics of its (Size, scale, site shape, layout, etc.) are very similar to those of contemporary private house. So we can extract some experience: use patios and courtyards in long and narrow of the house, both will bring more natural and comfortable microclimate environment and activity space for the house; the reasonable opening of the traditional house, the open indoor separation and so on can form better natural ventilation effect. Assume the private house prototype from traditional houses and use contemporary materials and techniques to improve building climate suitability can become one of the important strategies for the passive design of private housing in the study area.

On the other hand, in houses design stage, sometimes designers use some passive design means, they usually encounter the opposition of investors (houses users). This is because of the use of more complex structures and materials will lead to residential

construction period is long, construction costs increase. The designers need to do the following works to solve their problem. First, understand local materials; in the design process, try to choose common and cheap local materials; based on these local materials, study rational and effective construction methods to reduce construction costs. Second, explain to the user that even if there is a small increase in construction costs, but if there is a reasonable passive architectural design, we can reduce a lot of energy consumption, and after decades of use, the benefits will be far more than today's investment.

Conclusions

In the perspective of passive tropical design, the study analyzes the results of field observations, summarizes some typical problems in the design of the private house in Vietnam, and then discusses the corresponding solution. The overly dense building layout should not be used in hot and humid areas of Vietnam, the study suggests that to reduce the density and increase the green area in order to improve the ventilation and lighting conditions, create a good microclimate environment; In an environment where the solar radiation is extremely strong, the wall and roof design principle is the use of multi-layer, has its own shade effect and cooling effect of the construction; The exterior and interior of the building both should be opened to enhance natural ventilation effect.

The synthesis of the above problems vaguely reflects another problem. That is, some designers and users do not know enough about passive architectural design. Resulting in a low degree of adaptation to climate, sometimes missed the opportunity to enhance comfort, even the wrong design or use the method will lead to decreasing comfort. In this case, designers should improve their attention and basic knowledge of passive design, and consider the user's comfort as one of the primary objectives. The study recommended designers should explain the importance of passive architectural design for users; let the users know following the proper design guideline will be a useful and more meaningful step in the design of the private house in Vietnam.

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