Study on the Elements for the Psychological Comfort of the Tiny House’s Living Room in Japan by Layers and Window Area

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Abstract. In the context of environmental issues, financial instability, high mortgage and other issues, more and more people have to choose the tiny house. Tiny house movement is a return to houses of less than 1000 square feet (93 m²). Frequently the distinction is made between small (between 400 square feet (37 m²) and 1,000 square feet (93 m²)), and tiny houses (less than 400 square feet (37 m²)), with some as small as 80 square feet (7.4 m²). According to the general sense of residential, the comfort for a tiny house is difficult to ensure. Due to limitations conditions be the narrow land, constriction and occlusion sense is very strong, so “psychological comfort”, which is about people’s feeling, from “physiological comfort”, which is about the architectural area, should be priority. This paper analyzes the tiny house’s window area of the living rooms, by studying on 36 living rooms in tiny houses. All of these subjects are published in 4 books about “tiny house” around a journal named Jutakutokushu from 2006 to 2015. Through this study, several elements for a comfortable tiny house’s living room are grasped.

1. Introduction
In the context of environmental issues, financial instability, high mortgage and other issues, more and more people have to choose the tiny house. On the other hand, some people think that tiny house will be more refined, and some people want to have a minimum of space to pursue a “space is not wasted” life.

According to the general sense of residential, the comfort for a tiny house is difficult to ensure. Due to limitations conditions be the narrow land, constriction and occlusion sense is very strong, so “psychological comfort”, which is about people’s feeling, from “physiological comfort”, which is about the architectural area, should be priority.

Taking into account the living room is the most frequent place in a house; we choose to study the comfort for living room.

By studying the theory of comfort, analyze the example; this study is to find a cause of visual comfort for the living room in a tiny house in Japan. Visual elements of the viewpoint submit a comfort design optimization method of the living room in a tiny house in Japan.

1.1 The definition of tiny houses.
There is currently no set definition of what constitutes a tiny house.
In USA, the tiny house movement is a return to houses of less than 1,000 square feet (93 m²). Frequently the distinction is made between small, which is between 400 square feet (37 m²) and 1000 square feet (93 m²), and tiny houses, which is less than 400 square feet (37 m²), with some as small as 80 square feet (7.4 m²) [1].

In Japan, there is no definition of tiny house. According to the subjects in 4 books of journal Jutakutokushu[2-5] (table 1), which are talks about tiny house, we concern on some points:

| Table 1. The Architectural area data in 4 books by journal Jutakutokushu. |
|-----------------------------|-----------------|------------------|-----------------|-----------------|-----------------|
| ISSN | Less than 93 m² | 93-100 m² | Over100 m² | Total |
| 2007.12 | 7 | 1 | 0 | 8 |
| 2011.02 | 9 | 1 | 3 | 13 |
| 2012.05 | 10 | 4 | 2 | 16 |
| 2015.06 | 10 | 1 | 3 | 14 |

- About 70.59% of these works are less than 93 m².
- About 13.72% of these works are 93 m²-100 m².
- About 15.69% of these works are over 100 m².

And there is currently no set definition of what constitutes a tiny house. So in this study we select the tiny house less than 1000 square feet (93 m²).

1.2 The reason that more and more people choose tiny house.
In the context of environmental issues, financial instability, high mortgage and other issues, more and more people have to choose the tiny house.

Since the financial crisis, the global economic slowdown led to lower purchasing power. Tiny house use less money, fewer resources, so it is very attractive for young person just to work and no purchasing power homeless. Moreover, many low-income families are also more like to have a tiny house.

On the other hand, some people think that tiny house will be more refined; they think tiny house is more designing. And some people want to have a minimum of space to pursue a “space is not wasted” life.

Tiny house design costs cheaper, less waste of resources, more energy-efficient and easy to clean. So, more and more people choose tiny house.

2. Methods
By thinking of the authoritative, we choose 36 houses from the Japanese journal named Jutakutokushu, which is an authoritative journal in Japanese construction industry.

2.1 Data of these 36 subjects
In the context of environmental issues, financial instability, high mortgage and other issues, more and more people have to choose the tiny house (table 2).

| Table 2. Date of these 36 subjects from Jutakutokushu. |
|-----------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| ISSN | NAME | BA(m²) | L(D)'S | LAYERS | L(D)/HOUSES | L(D)'S | WA | WA/L(D)'S |
| 2007.12 | White Mouth | 85.32 | 8.72 | 1.5 | 10% | 5.81 | 3.51 | 60% |
| 2007.12 | Small House in Kokubunji | 67.75 | 20.40 | 2 | 30% | 10.20 | 9.32 | 91% |
| Year | House Name                                      | Floor Area | Roof Area | Walls | Ground Area | Elevator | Comments |
|------|------------------------------------------------|------------|-----------|-------|-------------|----------|----------|
| 2007.12 | Oval Panel House                                | 79.58      | 15.93     | 1     | 20%         | 15.93    | 11.14    | 70%     |
|       | The Minimize House with a Blow-by in the World  | 76.61      | 14.10     | 1     | 18%         | 14.10    | 9.82     | 70%     |
| 2007.12 | FU House                                       | 64.58      | 19.00     | 1.5   | 29%         | 12.67    | 8.56     | 68%     |
| 2007.12 | Azuki House                                    | 64.08      | 6.69      | 1     | 10%         | 6.69     | 6.27     | 94%     |
| 2007.12 | Kotetsu                                        | 33.75      | /         | /     | /           | /        | /        | /       |
| 2011.02 | Kuguri House                                   | 82.13      | 19.36     | 2     | 24%         | 9.68     | 1.12     | 12%     |
| 2011.02 | i-works House in 15 tsubo                     | 50.44      | 13.22     | 1     | 26%         | 13.22    | 5.24     | 40%     |
| 2011.02 | Air Conditioner-less House                    | 80.65      | 26.94     | 1.2   | 33%         | 22.45    | 10.99    | 49%     |
| 2011.02 | HOUSE TOKYO                                    | 78.30      | 25.59     | 1     | 33%         | 25.59    | 12.79    | 50%     |
| 2011.02 | Architects House                               | 56.75      | 16.71     | 2     | 29%         | 8.36     | 6.66     | 80%     |
| 2011.02 | Cliff House                                    | 43.70      | 11.90     | 1.2   | 27%         | 9.92     | 10.36    | 104%    |
| 2011.02 | House at Ueda                                  | 86.33      | /         | /     | /           | /        | /        | /       |
| 2011.02 | Split Machiya                                  | 54.62      | /         | /     | /           | /        | /        | /       |
| 2011.02 | Small House                                    | 67.34      | /         | /     | /           | /        | /        | /       |
| 2012.05 | House in Minamisawa House                     | 81.26      | 36.56     | 2     | 45%         | 18.28    | 2.10     | 11%     |
| 2012.05 | House At Higashiohizumi                       | 75.11      | 31.70     | 2     | 42%         | 15.85    | 3.01     | 19%     |
| 2012.05 | Nogizaka House                                 | 86.28      | 12.81     | 1     | 15%         | 12.81    | 5.44     | 42%     |
| 2012.05 | HOUSE IN AOTO                                   | 74.55      | 9.94      | 1     | 13%         | 9.94     | 4.05     | 41%     |
| 2012.05 | House in Ebara                                 | 78.67      | 15.94     | 1.5   | 20%         | 10.63    | 5.37     | 51%     |
| 2012.05 | Shidachi House in Karuizawa                   | 83.94      | 22.45     | 2     | 27%         | 11.23    | 11.4     | 102%    |
| 2012.05 | ZIX House                                     | 87.53      | 12.00     | 1     | 14%         | 12.00    | 19.10    | 159%    |
| 2012.05 | Riverside House                                | 55.24      | 8.02      | 1     | 15%         | 8.02     | 4.05     | 50%     |
| 2012.05 | 43base                                        | 69.58      | 8.47      | 1     | 12%         | 8.47     | 18.25    | 215%    |
| 2012.05 | HOUSE IN NAKAZAKI                              | 77.04      | /         | /     | /           | /        | /        | /       |
| 2015.06 | Toke House                                    | 60.33      | 13.22     | 1     | 22%         | 13.22    | 1.62     | 12%     |
| 2015.06 | House in Oizumi                                | 75.24      | 26.46     | 1.5   | 35%         | 17.64    | 5.54     | 31%     |
| 2015.06 | BOXHOUSE 151                                   | 90.27      | 28.22     | 1.5   | 31%         | 18.81    | 8.48     | 45%     |
3. Conclusions
According to the data, we concern on some points:
• Only 31 houses have living room.
• About 64.52% (20/31) of these houses’ living room is combined with dining room.
• About 45.16% (14/31) of these living rooms’ building area is from 10 m² to 20 m².
• About 70.97% (22/31) of the percentage of the construction area of the living room is from 11% to 30%.
• About 80.64% (25/31) of the percentage of the window area of the living room’s footprint is from 0% to 100%.
• Most house design will choose the form of layer overhead or half overhead to improve comfort.

According to the relationship between perception of the volume and the floor area, we concern that in the same volume, the higher the story feels more comfortable[6].
So most of the tiny house in the area, which cannot be increased, will choose layer overhead mode to increase the comfort of the living room.

Within hand’s reach range, compared to the sense of openness and brightness by windows, a house which is with windows, and the percentage of the window area of the living room’s footprint is over 50%, is openness and brightness and comfortable[7].

According to the data, we concern that a living room with windows and the percentage of the window area of the living room’s footprint is over 50%, which is more than one layer and less than two layers, is more comfortable than the others.

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