



## An After-Stay Satisfaction Survey of Residents Living in Prefabricated Concrete Structures in Thailand

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### ARTICLE INFO

*Article history:*  
Received 05 August 2013  
Received in revised form  
24 October 2013  
Accepted 09 December 2013  
Available online  
16 December 2013

#### *Keywords:*

Questionnaire survey;  
Prefabrication building;  
Residential satisfaction;  
Satisfaction criteria;  
Dormitories;  
Detached Houses;  
Townhouses.

### ABSTRACT

We have conducted an after-stay satisfaction survey of residents living in prefab concrete buildings. Many modern fast constructions make use of prefab parts, but no research on living satisfaction has been made. Multiple criteria questionnaire survey has been conducted to find out satisfaction on comfortable lives. Nine criteria have been surveyed: moisture protection, noise prevention, safety of structures, thermal prevention, air flow, external appearance, interior, facility, and overall satisfaction. Comparisons from the survey results in term of five-level Likert scale satisfaction are drawn from prefab-made dormitories, detached houses, and townhouses. The surveyed results are somewhat identical, but noise problems are the most concerns for people living in dormitories. For prefab-made detached houses and townhouses, problems in renovation and augmentation are highly alike in terms of difficulties and complexities, compared to non-prefab-made houses.

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## 1. Introduction

In Thailand, prefabricated concrete parts have been even more widely used in various types of constructions as it provides quick construction process with factory quality control.

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However, dwellers have never been asked if living in prefab structures provides satisfaction in terms of comfortable living and safety concerns. Therefore, our aim is to find out such satisfaction. Three residential types are studied including dormitories, detached houses, and townhouses (terraced houses). Questionnaires have been responded by 240 dwellers from Pathumtani and Chonburi provinces, Thailand. The survey data of each criterion is averaged to find the mean.

## 2. Literature Review

Auditing construction process through the use of total quality management has been suggested in order to meet customer satisfaction while maintain profitability (Hellard, 1993). Construction management and real estate sectors have faced a changing world with more specific demands and higher competitions (Kärnä, 2009). Prefabricated buildings use quality control components transported from factory to be assembled at the building site. This reduces some of the construction processing problems but greatly succinct construction time. Cost is always a concern with construction. The main prefab advantages are less time and waste, thus have cheaper cost (Diamond, 2010). Factors of Japanese prefab housing were studied after improving industrialized housing quality studied by Noguchi (2003). Great customer satisfaction makes widespread great reputation, thus more prefab houses are built especially more expensive high-quality homes.

In Malaysia, Mohammad (2009) studied the relationship between quality and satisfaction of house owners with construction systems and collected data by using sets of questionnaires. The SPSS software has been used to analyze the surveyed data. The study showed that house owners were highly satisfied with their houses and there was no significant relationship between quality and house owners' satisfaction except for the mechanical and electrical aspects of prefab and traditional construction systems.

In Florida, house design, house quality and service have been studied to empirically examine home builders' performance as measured by the degree of home buyers' satisfaction (Torbica and Stroh, 2001). In Finland, Kärnä (2009) studied customer satisfaction in construction and the factors affecting it and discuss utilizing and measuring the customer data in the multi-dimensional business environment of construction.

### 3. Methodology

#### 3.1.1 Customer Satisfaction

Customer satisfaction is a term used to indicate how products and services meet or exceed customer expectation or specified satisfaction goals. This work uses questionnaire as a tool to survey individual households regarding their satisfactions of the building they are living in.

#### 3.2 Questionnaire Survey

A questionnaire consists of a series of questions (open-ends or closed-ended questions). Total nine criteria are asked, including moisture protection, noise prevention, safety of structure, airflow, thermal prevention, external appearance, interior, facilities, and overall satisfaction. Each criterion, there are five satisfaction levels to be answered. A privacy statement is noted that the identity of interviewers is not collected. The pilot test questionnaire is conducted for ten respondents to obtain feedbacks for improvements. After the pilot test, the questionnaires are revised such that each question can be more clearly understood. The satisfactions are derived from the five Likert scale questionnaire with

- 1: No satisfaction,
- 2: Fair satisfaction,
- 3: Satisfaction,
- 4: Good Satisfaction, and
- 5: High Satisfaction.

In this study, total 240 respondents are randomly selected from three habitat types, dormitories, detached houses, and townhouses. A wide range of respondents is from different age groups of males and females.

### 4. Study Result and Discussion

Respondents classified by Gender, Ages, and Habitats are illustrated in Table 1. Most of the respondents are 20-40 age groups. Townhouse respondents are about half of the respondents from detached house and dormitory.

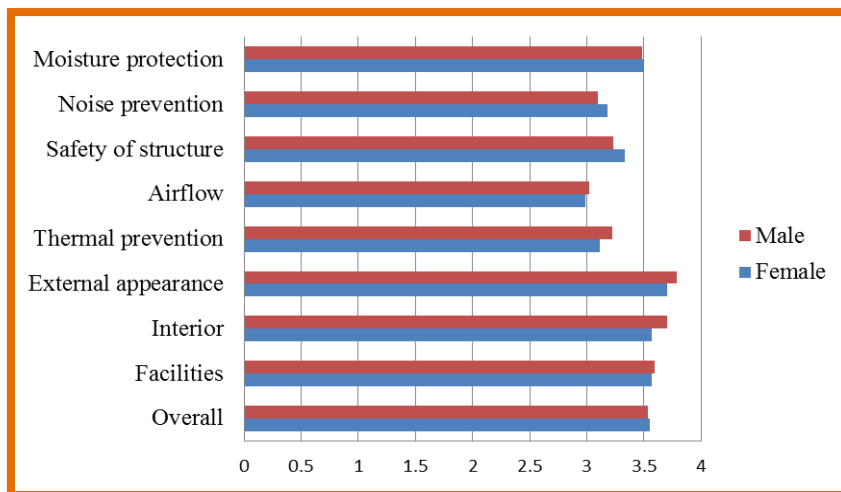
**Table 1:** Three-way cross tabulation: Respondents classified by Gender, Ages, and Habitats

Habitats		Ages				Total
		<=20	21-40	41-60	>60	
Townhouse	male	0	12	6	0	18
	female	1	18	5	1	25
	<b>Total(percent)</b>	1(2.32%)	30(69.76%)	11(25.58%)	1(2.32%)	43(100%)
Detached house	male	13	14	15	5	47
	female	14	23	12	8	57
	<b>Total(percent)</b>	27(25.96%)	37(35.57%)	27(25.96%)	13(12.5%)	104(100%)
Dormitory	male	18	25	1		44
	female	24	25	0		49
	<b>Total(percent)</b>	42(45.16%)	50(53.76%)	1(1.07%)	0(0%)	93(100%)
<b>Grand Total(percent)</b>		70(29.17%)	117(48.75%)	39(16.25%)	14(5.83%)	240(100%)

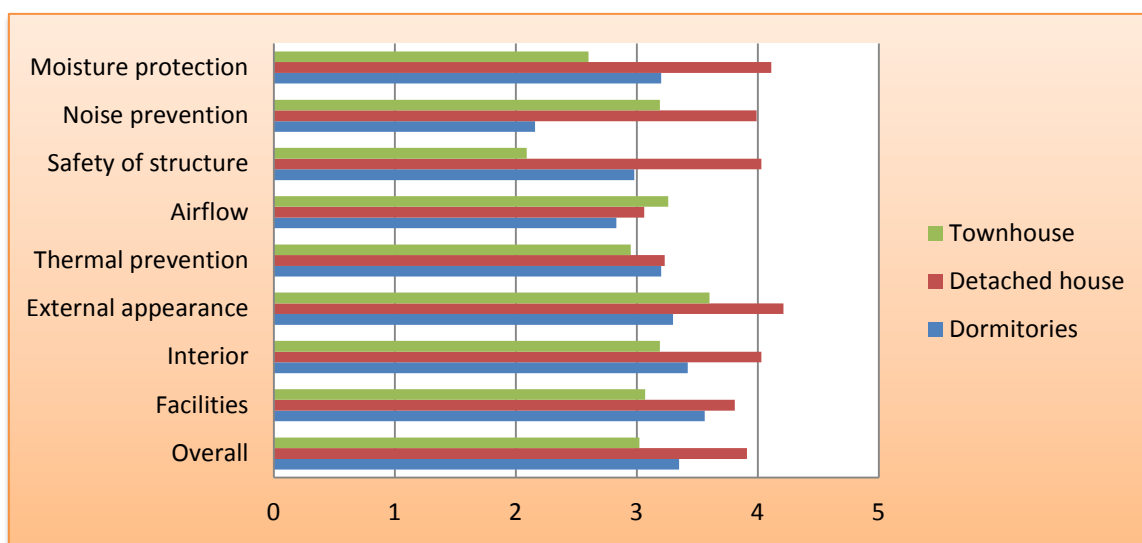
**Table 2:** Frequencies of population classified by satisfaction criteria

Criteria		Frequencies					Mean	Standard Error of Mean
		Satisfaction level						
		1	2	3	4	5		
Moisture protection	n	8	30	69	103	30	3.49	0.063
	percentage	3.3%	12.5%	28.8%	42.9%	12.5%		
Noise prevention	n	28	44	64	75	29	3.14	0.077
	percentage	11.7%	18.3%	26.7%	31.3%	12.1%		
Safety of structure	n	26	33	69	73	39	3.28	0.078
	percentage	10.8%	13.8%	28.8%	30.4%	16.3%		
Airflow	n	10	51	116	54	9	3	0.056
	percentage	4.2%	21.3%	48.3%	22.5%	3.8%		
Thermal prevention	n	6	35	122	66	11	3.17	0.053
	percentage	2.5%	14.6%	50.8%	27.5%	4.6%		
External appearance	n	3	10	74	110	43	3.75	0.054
	percentage	1.3%	4.2%	30.8%	45.8%	17.9%		
Interior	n	0	19	81	107	33	3.64	0.053
	percentage	0.0%	7.9	33.8%	44.6%	13.8%		
Facilities	n	0	19	101	82	38	3.58	0.055
	percentage	0.0%	7.9	42.1%	34.2%	15.8%		
Overall	n	0	23	95	92	30	3.54	0.054
	percentage	0.0%	9.6	39.6%	38.3%	12.5%		
<b>Total</b>							3.40	0.060

Table 2 shows the percentage on each satisfaction level for all criteria. Most residential satisfactions are level 3 and 4 for every criterion. Moisture protection, safety of structure, external appearance and interior, and noise protection criteria yield good satisfactions (level 4). Airflow, thermal prevention, facilities and overall satisfaction give medium satisfactions (level 3). Obviously, interior, facilities and overall criteria show no satisfaction (level 1). Means of all criteria are in ranges of 3 to 4 out of 5. Figure 1, the satisfaction mean is classified by male and female, in percentages. Both male and female, the mean results for facilities, external appearance and interior criteria show good satisfaction (level 4). The survey yield medium satisfaction (level 3) for airflow, thermal prevention, moisture protection, noise protection, safety of structure, and overall satisfaction.

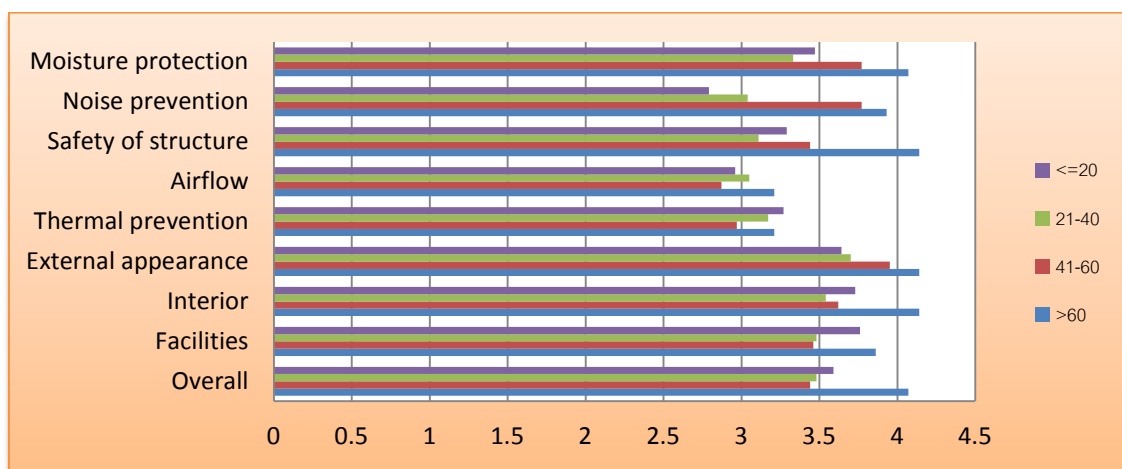


**Figure 1:** Averaged satisfaction bar chart classified by gender.



**Figure 2:** Averaged satisfaction bar chart, classified by habitats.

Figure 2 the satisfaction mean is classified by townhouse, detached house and dormitory, in percentages. For townhouse, mean of safety of structure criteria gives a fair satisfaction (level 2). External appearance criteria yield good satisfaction (level 4). For the rest the highest percentages are medium satisfactions. For detached houses, most satisfaction criteria yield good satisfaction except that airflow and thermal prevention yield medium satisfaction. For dormitory, mean of noise prevention criteria yield fair satisfaction (level 2). Facilities criteria give good satisfaction (levels 4). For the rest of the satisfaction criteria are medium satisfaction (level 3).



**Figure 3:** Averaged satisfaction bar chart, classified by age groups.

Satisfaction means are classified by age as showed in Figure 5.3. For age group <=20, moisture protection, noise prevention, safety of structure, airflow, and thermal prevention criteria yield medium satisfaction (level 3). For 21-40 age groups, both external appearance and interior criteria show good satisfaction (level 4) followed by 41-60 age groups, moisture protection, noise prevention, external appearance, and interior criteria give good satisfaction (level 4). Finally >60, airflow and thermal prevention give medium satisfaction (level 3).

## 5. Result Summary

The total population of the sample is 240 persons, being male 109 (45.4%) and female 131 (54.58%). Satisfactions of respondents are classified by gender, habitat, and age groups. From the analysis of all questionnaire questions with five satisfactory levels, overall mean is 3.40 with standard mean error 0.06. For consideration regarding habitat types, means of

townhouse, detached house, and dormitory satisfaction are 3.00, 3.82, and 3.11, respectively. Means of townhouse and dormitory are lower than detached house due to low means of safety of structure, moisture protection, and noise prevention criteria. For consideration regarding range of age, satisfactions for noise prevention and airflow criteria are low for  $\leq 20$  and 21-40 age groups, and for airflow and thermal prevention are low for 41-60 and  $>60$  age groups.

## 6. Conclusion

This work studies about after-stay satisfaction survey of people inhabiting in three types of prefabricated concrete buildings: townhouse, detached house, and dormitory. A questionnaire survey has been focused to find out satisfaction on comfortable lives. We have total 240 respondents. Nine criteria have been surveyed: moisture protection, noise prevention, safety of structures, thermal prevention, air flow, external appearance, interior, facility, and overall satisfaction. The surveyed results are somewhat identical, but noise problems are the most concerns for people living in dormitories. We also found that, for prefabricated-made detached houses and townhouses, problems in renovation and augmentation are highly alike in terms of difficulties and complexities, compared to non-prefabricated-made houses. Results will be statistically analyzed and presented in the next work.

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**Peer Review:** This article has been internationally peer-reviewed and accepted for publication according to the guidelines in the journal's website. Note: Original version of this article was accepted and presented at the International Workshop on Livable Cities (IWLC2013) - a joint conference with International Conference on Sustainable Architecture and Urban Design (ICSAUD2013) organized by the Centre of Research Initiatives and School of Housing, Building & Planning, Universiti Sains Malaysia, Penang, Malaysia from October 2<sup>rd</sup> to 5<sup>th</sup>, 2013.