Types of Housing Defects that Appear in Malaysia Using Defect Index (DI) Method

by

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CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

DECHA BUERAHENG

DECHA BUERAHENG

ABSTRACT

Malaysia is among the developing countries and many projects are be implemented. Currently, some of these projects include the construction buildings. The construction industry contributes to generating the economy and such as the provision of services to construction companies but some of these listed companies lack of professionalism by getting involved in projects that are not in the standard, especially Housing Development. There are many defects in the Purchased homes of the house Buyers, particularly in terms of material and processing. This study is conducted to identify the defect level based on common types of housing defect that appear in Malaysia by using Defect Index (DI) Method based on 15 building elements proposed by Pedro (2008) to be a framework of tropical housing and the result from this study can assist the contractors and developers to concern more on particular building elements that have medium high level of defects. The methodology adopted is through literature review and a questionnaire survey are used as data collection mechanism and it is prepared, distributed and collected within a short period of time to the respondents involve in Malaysia Property Exposition 2011 (MAPEX 2011) in Perak and Klang Valley. The result shows that the terrace houses that were built in Kuala Lumpur for less than 5 years, there are severe defects on Electricity Installation and Water service but there is a medium defect on Drainage.Otherwise, the apartments and terrace houses that were built in Perak for more than 5 years but less than 15 years, there is a medium defect on Electricity Installation but there are severe defect on Water service and Drainage. In order to minimize the defect level, the contractors and developers should do the improvement on the elements that have severe defects which are water service and drainage system and also for the elements that have medium defect which is electricity installation. This improvement is for the better quality of the houses and will decrease the house users' complaint.

ACKNOWLEDGEMENT

In this opportunity, the author would like to express his grateful to those who had assisted him in completing the final year project successfully.

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CHAPTER 1
INTRODUCTION

1.1 Background of Study

According to REHDA website (2011), In the consequences of the Asian Financial Crisis in the late 1998, the Real Estate and Housing Developers' Association [REHDA, then known as the Housing Developers' Association (HDA)] highlighted to the then Prime Minister, Tun Dr Mahathir Mohamed of the huge overhang in the property market and urged for instant actions to be taken to address the critical problem. After several rounds of urgent dialogues and discussions between the Government and REHDA, the government declared special incentives to help ease the property project. Such incentives included the release of bumiputera units, stamp duty exemptions as well as higher margin of financing by financial associations. At the same time, REHDA was also pushed to manage a series of property exhibitions in combination with the special incentives. Therefore, the Home Ownership Campaign I (HOC I) was visualized.

Following the success of HOC I in reducing property overhang, the Government approved further incentives in 1999 to help boost the property segment. Again, REHDA was called upon to arrange another Home Ownership Campaign (HOC II) in 1999, which was also well received.

Arising from the two HOC, REHDA saw the need to manage such expositions on an annual basis to afford a suitable forum for developers to exhibit properties of various types and for homebuyers to observe the latest and available launches and property stock all under one roof. Since then, REHDA has organized 6 national level property exhibitions [known as the Malaysian Property Exposition (MAPEX)] in the Klang Valley and more than 50 state level exhibitions throughout the nation.

Over the years, MAPEX has received overwhelming reactions from developers, industry players, NGOs and government departments with a regular involvement of more than 100 developers and 10 financial institutions in each of the expositions. The HOC and MAPEX exhibitions are typically seized over a period of 3 to 4 days and have become the signature property event each year, recording thousands of transacted properties.

MAPEX has since assisted many Malaysian homebuyers to buy their dream homes at reasonable prices. It has helped generate demand for housing and guarantee sustained growth of the housing and property industry.

MAPEX is the way for author to collect the information about housing defect that occurred in the building in Malaysia. Now one might ask, how were these defective buildings allowed to be occupied assuming that they have met the requirements of building by-laws and are certified fit for occupation. Many researches had been done to prevent this problem.

Nevertheless, this problem still cannot be solved. If this problem can be solved, it will prevent uncomfortable to customer, reduce the maintenance of building to people which maybe close up million dollars per year.

The quality of the workmanship is another aspect that has been giving contractors a bad name. The Construction Industry Development Board (CIDB) is supposed to wrestle this issue by requiring all relevant laborers or those in a similar trade to undergo a skills training programmer conducted by the CIDB Academy.

Besides, lack of enforcement and supervision also contributed to these defects. However, a good project management team acting on behalf of the client should be able to look after the awareness of its clients by making sure the contractors do not compromise on the quality of the workmanship through its resident engineer.

1.2 Problem Statement

Building defect is one of the major components of building that needed attention. When a building fails to perform as it should, we right away look for answers. Is the problem an act of nature? Is it the result of someone's failure to assemble it properly? Was the suitable maintenance of the building not performed as it should have been? The answers frequently depend upon a number of factors: the age of the affected building component, the exact nature of the problem, the presence or absence of human error, or some combination of all three factors.

According to the National Building Agency (1985), defects occur either because of poor design, or low quality workmanship, or because the building was not constructed according to the design, or because it has been subject to factors not allowed for in the design. These primary causes may operate singly or in combination and result in defects indicated by changes in composition of materials; in the construction itself; in the size, shape or weight of materials; or simply in appearances.

Tyler (2008) states that defects occur because the materials used often require periodic maintenance to maintain their projected service lives; and because acts of nature often intervene to test the resistance of building components to leaks and decay, it is usually never exactly clear why a particular building defect occurs. The average person who might sit in judgment one day cannot easily understand, much less unwinds the disputes that arise over these mysterious, technical and often costly problems.

1.3 Objectives

The objectives of carrying out this study are as follow:

a) To identify the defect level based on common types of housing defect that appear in Malaysia by using Defect Index (DI) Method proposed by Pedro (2008) to be a framework of tropical housing.
b) The result from this study can assist the contractors and developers to concern more on particular building elements that have medium high level of defects based on Defect Index (DI).

1.4 Scopes of Study

The study will be carried out the data on housing defect based on questionnaire that will be prepared, distributed and collected within a short period of time to the respondents involve in Malaysia Property Exposition 2011 (MAPEX 2011) that will take place as below (Refer Appendix A);

a) In Perak at stadium Indera Mulia, Ipoh on 23 – 26 June 2011 and
b) In Klang Valley at Hall 4, Putra World Trade Center (PWTC) on 1 – 3 July 2011.

This project is about housing defect which is relevant to Urban Engineering aspect that is under Civil Engineering Programme. The project can be finished within the time frame of 1 semester which is about 4 months and it is within the scope of study.

CHAPTER 2
LITERATURE REVIEW

The most significant or possibly most accurately primary function of a house is "to provide protection and also provide a living space for families" (Agustin, 1990, p.500). As such, it offers protection to people from awful weather and risk, of any forms. It is also a place where people live their lives, keep their belongings and rest after work or school. Because of these basic needs, people are willing to spend a considerable amount of their money to purchase or rent a house. When it comes to occupying a house, whether purchased or rented. Ong (1997) views that defects are unavoidable in a housing construction, but the fact remains that a house with full of defects will have negative impact on the occupiers. As a result, defects may cause hardship in terms of physical or mental health to the occupiers, and even affect in the house not considered safe to live in.

The arranging of the paper is as follow. Firstly, this paper will present the definitions of housing defects. Secondly it will review the method in measuring defects and identify the building elements to be used in the measurement. In the last part of the paper, the results and some discussions of their suggestion to the housing industry will be presented.

Defects in housing: A defect can be described as "a failure in appearance, performance or function of structure, services and other facilities in a building" (Pheng and Wee, 2001, p.6). According to Olubodun (2000) defect is to be predictable when there is complaint about the condition of the building. Karim, Marosszeky and Davis (2006) seem to suggest that a defect is an outcome of a work which does not fit in with the contractual documents. In this study, defect is defined as a failure in appearance; performance and function of building elements that impairs the house's value and prevents the building from being perfect to the would-be buyers.

As discussed in Chong and Low's (2005) study, defect might appear in the construction stage as well as the occupancy stage. However in this study, we will only place our concern on the defects appearing in the occupancy stage. A report provided by Members of Homeowner Against Deficient Dwelling (HADD) (2004) shows that the most common defects in new home construction is the foundation (which affect doors, windows, wall and floor), concrete (affecting the floor), windows, paint, roof, plumbing (impact on the toilets, shower, sink, drain, wall and floor), doors, structural (which affect floor, wall and roof) and electrical aspect of the house. This list of defects is compiled from the homeowners, reviews of news articles and complaints by several agencies.

The defects "will arise over time through the effects of climate, usage, and wear and tear" (Chew, Tan & Kang, 2004, p80). On the other hand, the defect is not an exception to a newly-built house. For example, in the case of houses in the UK, a large number of defects "can be found in the newly-built houses and this has disappointed the house buyers" (Sommerville & McCosh, 2006, p.6). Nevertheless the degree of the defects and their frequency for each building are not the same. Chong and Low (2005) study the comparable defects in construction and occupancy stages and learn that the floor defect is the most prominent element. It is due to the poor workmanship, use of material quality as well as the fact that developers tend to rush in completing the job. The most frequent floor defects that occur at occupancy stage are cracks, water seepage, delaminated tiles, unevenness, stains, hollowness, discolored tiles, efflorescence and chip off. On the other hand, Olubodun and Mole (1999) have found that wall cracks are the most frequent defect followed by dampness in solid floor, condensation, slab failure and rot problem.

Intervention from industrial practitioners and workers practice may slow down the process of defects. However there are cases where the practitioners themselves may be the one who have committed the defects. In a study by Sufian and Ab Rahman (2008) that twenty six house buyers' complaints on the quality workmanship of the workers and the failure of the practitioners to detect them during construction are received. The complaints are about the asbestos ceilings that are not installed, the water PCC vent with only one layer instead of the required two layers, roof rafter of

various sizes and the fact that they are not made from the required hardwood. According to Sufian and Ab Rahman (2008) also declare that all of the problems above occur because developers are not following the specification in the approved plan.

Measuring defects: Basically, Johnsson and Meiling's (2009) declare that there are two ways in measuring housing defects which are in terms of frequency and severity. Firstly, defects can be measured in terms of frequency e.g. how many defects are present in a house. However it is tough to measure the frequency of defects as Sommerville (2007) stresses that there is no standard way to express defects as it varies from one to another. For example, there is double line crack on a wall with different lengths therefore; do we perceive them as one defect or two? On the other hand, Straub (2009) suggests that if the building components show more than one defect, the condition should be calculated using the "defects score". Secondly, defects can be measured in terms of the severity. As Karim, Marosszeky and Davis (2006) explain that Severity of defects is an important consideration when discussing the issue of defects. Pedro (2008) believes that the effects of defects on the functional condition, type of repairs and the degree of repairs needed are all related to the severity of defects. This is supported by Johnsson and Meiling (2009) who assert that the severity of defects is related to not only the type of defects, but also the cost in correcting it.

Georgiou (1999) and Stephenson (2002) classify the severity of defects into major and minor severity whereas Pedro (2008) extends this further by segregating the defects into critical, severe, medium, slight and minor. Major or critical defects can be defined "when the elements fail to operate and cannot be used for their intended purpose" (Stephenson, 2002), also "endanger health or safety, and may cause major accidents other than requiring complex repair" (Pedro, 2008). Minor defect is more aesthetic. "Minor and slight defects may cause slight problems to the occupiers" (Stephenson, 2002) and only "need simple repairs" (Pedro, 2008).

In order to measure and compare the level of defects, this study will use the Defects Index (DI) method. This method measures defects by points based on the severity of defects. A scale will be used to know the condition of a building. A study by Pedro

(2008) in discussing the DI method, has found that the method is adequate to measure the housing condition compared to the traditional method, which is too simple that it fails to meet the objective in assessing the building conditions. The defects scores are based on the severity of defects occurring in the house. The explanation for each severity is as stated in Table 2.1.

Table 2.1: Explanation for each defect score

Minor Defects	No defects or defects without noteworthy
Slight Defects	Defects that affect the aesthetic value
Medium Defects	Defects that affect the aesthetic value and user comfort
Severe Defects	Defects that affect the user comfort and endanger health and safety and may cause Minor accidents
Critical Defects	Defects that endanger health or safety and may cause major accidents

Source: Pedro (2008, p.329)

In that case, there is also a question of what to measure. As stated by Josephson and Hammarlund (1999) that it is necessary to have information about where the defects occur, in order to focus on where the enhancement measures are most impressive. In this case, "the measurement can be done by compartmentalizing the house e.g. kitchen, living room, bedroom, bathroom, balcony, entry and laundry" (Karim, 2006). However, if the measurement is by space or section, it "will have an exhaustive checklist of defects and the element such as floor or wall is repeated" (Frey, 2007). Although it will provide more detailed results, "the occupiers as the respondent might feel inconvenient at having to supply the details accurately every inch of the house" (Dillman, Sinclair & Clark, 1993). In order to address this issue, we follow the suggestion of Chong and Low (2006) and Oladapo (2006) that to measure defects by building elements rather than by housing compartments.

According to Heine (1999) building elements can be defined as the representative unit which is part of the whole building. In Aygun's (2003) study classifies building elements into functional elements (for example floor and wall), the structural system (for example beam and foundation) and service system (mechanical and electrical). While in Pedro's (2008) study, he organizes the building elements into three groups

namely the building as a whole, the shared parts and the unit. This study makes close reference to Pedro (2008), but only the building as a whole and the units are brought to light, as the shared parts is only for the high rise building and this study only focuses on land properties. There are a number of advantages where measuring the defects by elements is concerned. Firstly, it is more comprehensive as "each of the important elements in the building is evaluated by the occupiers themselves" (Pedro ,2008) and secondly Olubodun (2000) may identify which elements have high level defects and correcting can then be focused to the elements.

The selection of building elements is based on the importance of the building elements to the occupiers. Apart from the building elements identified by Pedro (2008), plumbing facilities and drainage system are added which are important in the context of tropical housing. In total, fifteen building elements have been selected namely roof; internal and external floor; internal and external wall; internal and external doors; windows; ceiling; stairs; electricity service; plumbing facilities; sanitary equipment; water supply and drainage. Table 2.2 presents all the building elements manipulated in this study.

Table 2.2: Building elements used in this study

Building Elements
1. Roof
2. External Wall
3. Windows
4. External doors
5. External floor
6. Ceiling
7. Stairs
8. Internal Wall
9. Internal Doors
10. Internal Floor
11. Sanitary equipment
12. Electricity services
13. Water supply
14. Plumbing facilities
15. Drainage

CHAPTER 3
METHODOLOGY

3.1 Used Methodology

After the project's topic has been approved and the preliminary requirements are defined, the methodology that suitable with the project is discussed. From author's research, this methodology is decided as shown in Figure 3.1 and Table 3.1, 3.2 and 3.3:

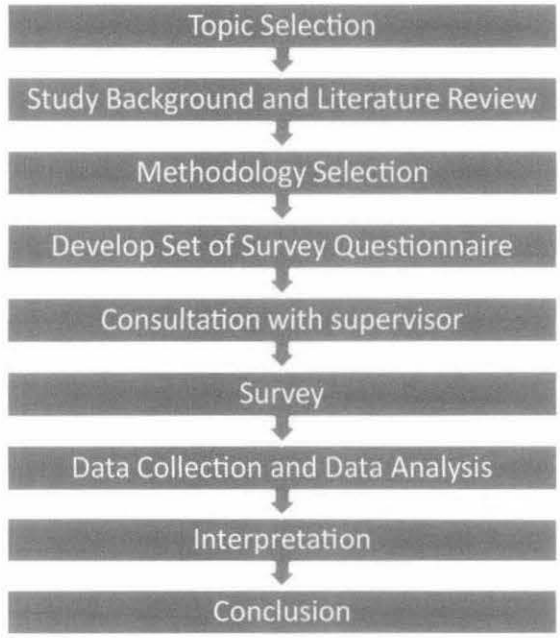

Figure 3.1: Methodology

Table 3.1: Methodology and duration of time usage

Detail / Week	1	2	3	4	5	6	7	8
Topic Selection								
Study Background and Literature Review								
Methodology Selection								
Develop Set of Survey Questions								
Consultation								
Survey								
Data Collection and Data Analysis								
Interpretation								
Conclusion								

Table 3.2: Timeline for FYP 1

No.	Detail/ Week	1	2	3	4	5	6	7		8	9	10	11	12	13	14
1	Selection of Project Topic															
2	Preliminary Research Work															
3	Submission of Extended Proposal Defence															
4	Proposal Defence															
5	Project work continues															
6	Submission of Interim Draft Report															
10	Submission of Interim Report															

Mid-semester break

Suggested milestone

Process

Table 3.3: Timeline for FYP 2

No.	Detail/ Week	1	2	3	4	5	6	7		8	9	10	11	12	13	14	15
1	Project Work Continues																
2	Submission of Progress Report																
3	Project Work Continues																
4	Pre-EDX																
5	Submission of Draft Report																
6	Submission of Dissertation (soft bound)																
7	Submission of Technical Paper																
8	Oral Presentation																
9	Submission of Project Dissertation (Hard Bound)																

Mid-Semester Break

Suggested milestone

Process

3.2 Data Collection Methods

In the project, researching and gathering information play a key role. Some research methodologies that are used are:

3.2.1 Questionnaires

A questionnaire survey is used as a data collection mechanism and the respondents for this study are naturally, the occupiers of houses in Malaysia. The rational of appointing the occupiers of the houses as respondents is because they are the best first-hand informer for the conditions of their houses in the post-occupancy stage. The choice of such respondents is also decided, "considering their experiences as users and their perceptions that will add value to the house" (Fernandes, Teixeira & Lopes, 2007, p.1859). The occupiers of houses are approached personally by the author so that any doubt about the question can be clarified. Moreover, the questionnaire can be collected within a short period of time.

The questionnaire is split into two sections. Section A asks for the respondents' identification and section B enquires on the housing defects. Section A consists of eight (8) questions asking about the respondents' background. Section B has fifteen (15) questions dealing with the defects level on the 15 building elements as previously identified. These building elements were adopted from previous studies. Adopting the Defects Index (DI) method by Pedro (2008), the five scales of defects severity: 1= minor; 2= slight; 3= medium; 4= severe and 5= critical were used to measure the defects in one element to another. There is one (1) open question to put any comments at the end of section B. (Refer Appendix B)

In this study, a self-administered questionnaire is used as data collection tools. According to Sekaran (1992), the advantage of a self-administered or personally administered questionnaire is that any doubt about the question can be raised and clarified. Moreover, the questionnaire can be collected within a short period of time. In this study, following Neuman (2000) the questionnaire is given directly to the respondents.

3.2.2 Statistical Methods

Microsoft Excel and Google Document Online Survey are used for the faster way and better look to analyze the results of the questionnaires and coming up with some graphics and visual aids about the statistical numbers collected.

3.2.3 Searching on Internet

Gather basic information about other related papers or journal articles for literature review as well as housing defect issue in general by searching on Internet.

3.3 Data Analyzing Methods

In order to measure and compare the level of defects, this study will use the Defects Index (DI) method. This method measures defects by points based on the severity of defects. A scale will be used to know the condition of a building. A study by Pedro (2008) in discussing the DI method, has found that the method is adequate to measure the housing condition compared to the traditional method, which is too simple that it fails to meet the objective in assessing the building conditions. The defects scores are based on the severity of defects occurring in the house. The explanation for each severity is as stated in Table 3.4.

Table 3.4: Explanation for each defect score

Minor Defects	No defects or defects without noteworthy
Slight Defects	Defects that affect the aesthetic value
Medium Defects	Defects that affect the aesthetic value and user comfort
Severe Defects	Defects that affect the user comfort and endanger health and safety and may cause Minor accidents
Critical Defects	Defects that endanger health or safety and may cause major accidents

The selection of building elements is based on the importance of the building elements to the occupiers. Apart from the building elements identified by Pedro (2008), plumbing facilities and drainage system are added which are important in the

context of tropical housing. In total, fifteen building elements have been selected namely roof; internal and external floor; internal and external wall; internal and external doors; windows; ceiling; stairs; electricity service; plumbing facilities; sanitary equipment; water supply and drainage. Table 3.5 presents all the building elements manipulated in this study.

Table 3.5: Building elements used in this study

Building Elements
1. Roof
2. External Wall
3. Windows
4. External doors
5. External floor
6. Ceiling
7. Stairs
8. Internal Wall
9. Internal Doors
10. Internal Floor
11. Sanitary equipment
12. Electricity services
13. Water supply
14. Plumbing facilities
15. Drainage

CHAPTER 4
RESULT AND DISCUSSION

This section analyze the findings from surveys that were conducted for the respondents involve in Malaysia Property Exposition 2011 (MAPEX 2011) at Ipoh and PWTC (Refer Appendix A), where a total number of 59 respondents from the total 70 prepared questionnaire have responded regarding to our subject matter (Refer Appendix B). The duration for the response start from 23rd June until 3rd July.

With the use of Google Document Online Survey Form to produce the good look of visual aid result. The overall result of the surveys shown as refer to Appendix C.

4.1 Part A: Respondents' Backgrounds

From the survey in figure 4.1, more than half of the respondents are male.

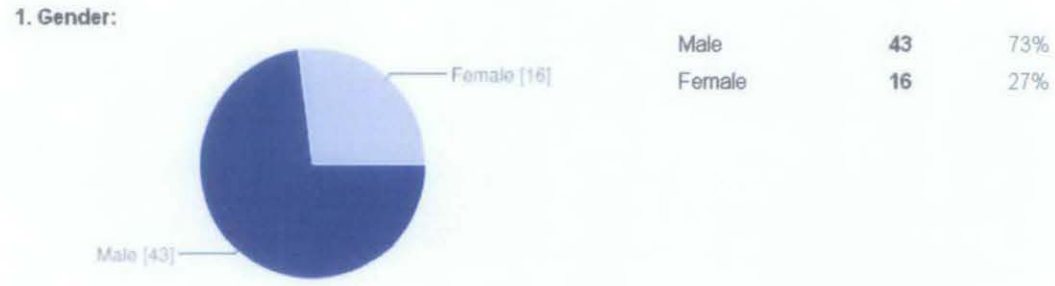

Figure 4.1: Gender of respondents

The result shown in figure 4.2 below helps to know that many of consultants and following by contractors that participate in this event. It makes the result more reliable as the respondents have good ability to identify the defect and can give some comment which is helpful.

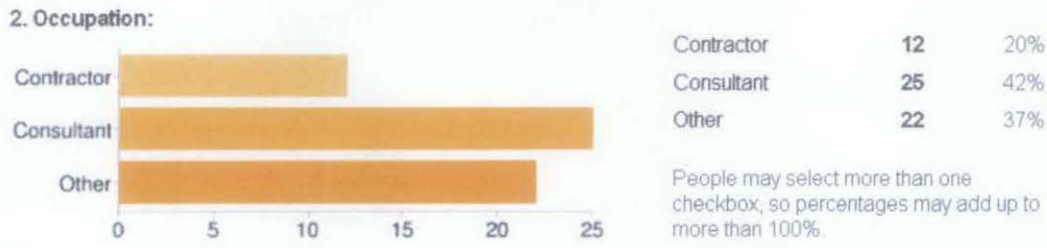

Figure 4.2: Occupation of respondents

More than half of the respondents have monthly income in the range of RM2,000 – RM4,000 as shown in figure 4.3. This result proves that home buyers come to this event with possible hope to purchase the houses with reasonable prices based on their income which is not high.

Figure 4.3: Monthly income of respondents

Most of the respondents come from Perak and Kuala Lumpur as the event took place in Ipoh and PWTC accordingly. The organizer of MAPEX will get benefit from this result as Home buyers will participate in the event that nears their location of the current houses (Refer to figure 4.4 below).

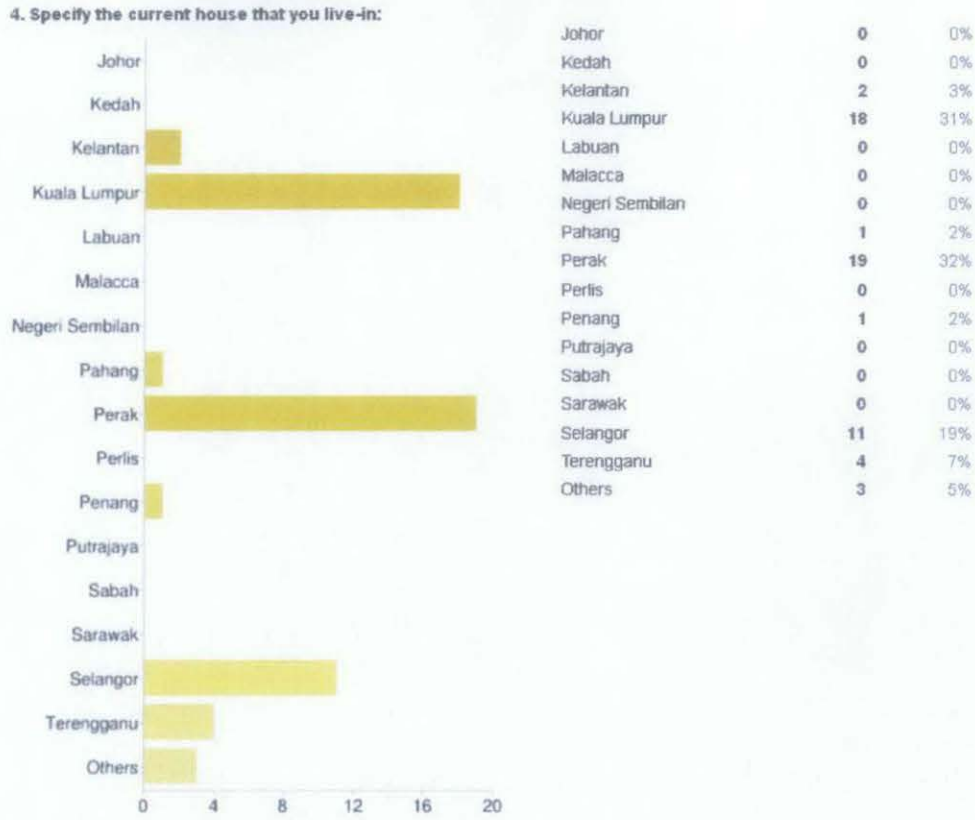

Figure 4.4: Current houses of respondents

Figure 4.5 below shows that the respondents are mostly staying in the terrace houses and apartments. The defects occurrence will be more specific and easily focus based on these particular types of houses.

Figure 4.5: Types of current house that respondents are staying

More than half of the result in figure 4.6 shows that respondents have been staying in their current houses for less than 5 years and following by staying for between 5 – 15 years.

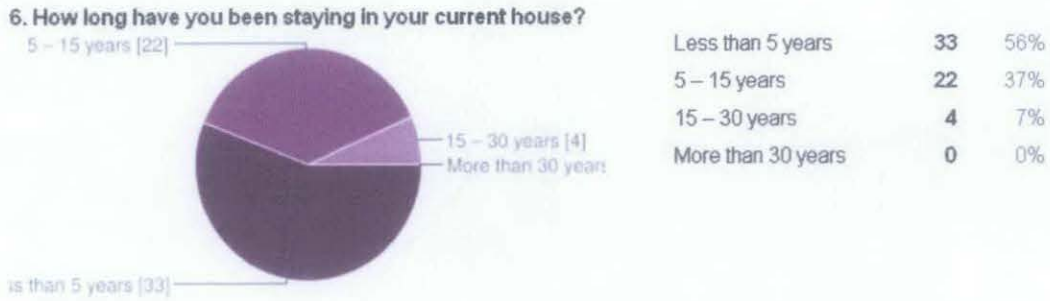

Figure 4.6: Duration of respondents' staying in their current houses

According to figure 4.7 below, most of them are not the first person to live in their current houses since the house was built and they live at least 5 years in these current houses. It gives us an idea about that the defect will be certainly recognized after 5 years.

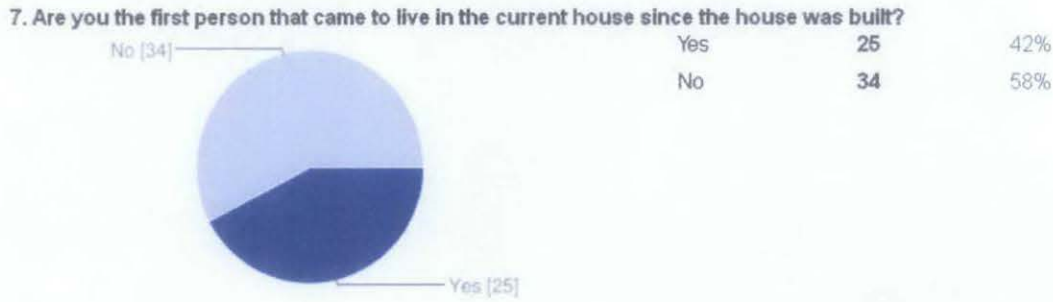

Figure 4.7: First person living in current house since the house was built or not

Figure 4.8 below shows that more than half of the respondents are not owner of the houses and they are just tenant. Status of tenancy will differentiate between home owners and tenants about the concern of the condition of the houses. Basically, the owners of the houses have more concern about the condition of the house than the tenants. The condition of the houses might be worse if lack of concern.

Figure 4.8: Status of tenancy

4.2 Part B: Level of Defects in Building Elements

4.2.1 Minor Defects that no defects or defects without noteworthy

From the result in figure 4.9 – figure 4.15 below, there are minor defects that no defects or defects without noteworthy on these building elements which are roof, windows, external doors, stairs, internal walls, internal doors and internal floor.

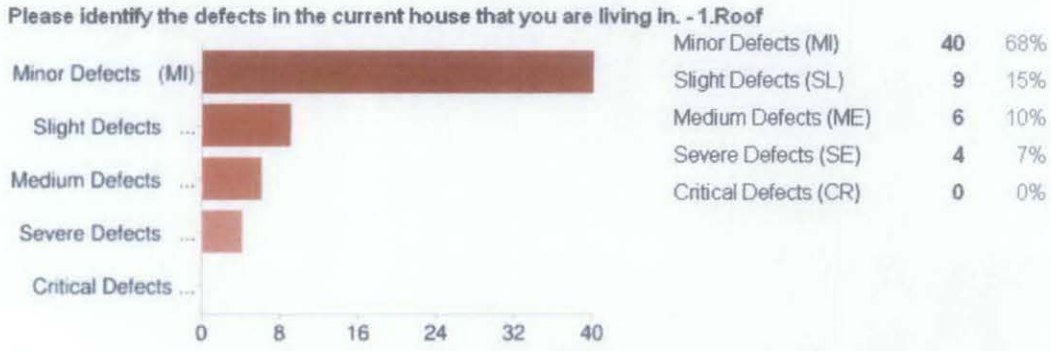

Figure 4.9: Level of Defect in Building Element for Roof

Figure 4.10: Level of Defect in Building Element for Windows

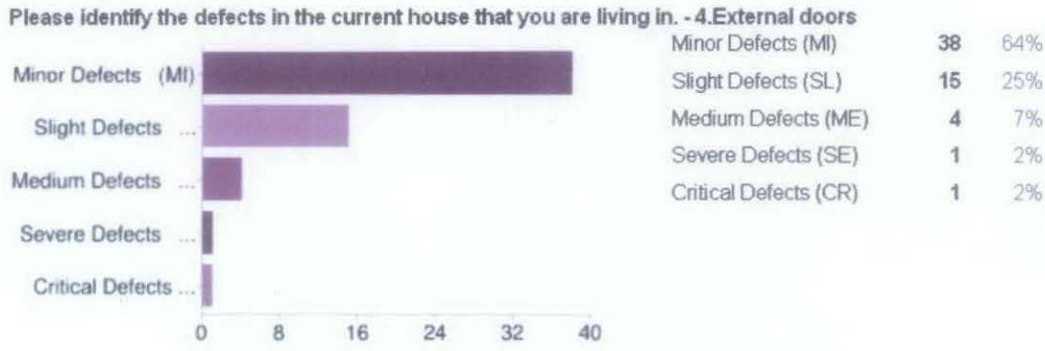

Figure 4.11: Level of Defect in Building Element for External Doors

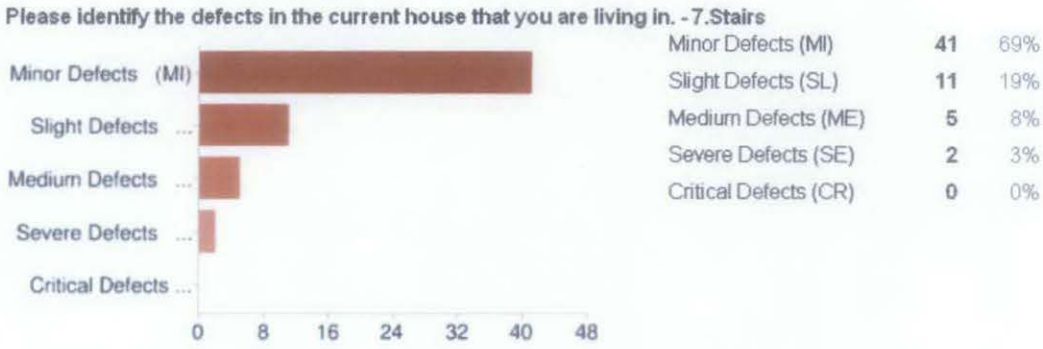

Figure 4.12: Level of Defect in Building Element for Stairs

Figure 4.13: Level of Defect in Building Element for Internal Wall

Figure 4.14: Level of Defect in Building Element for Internal Door

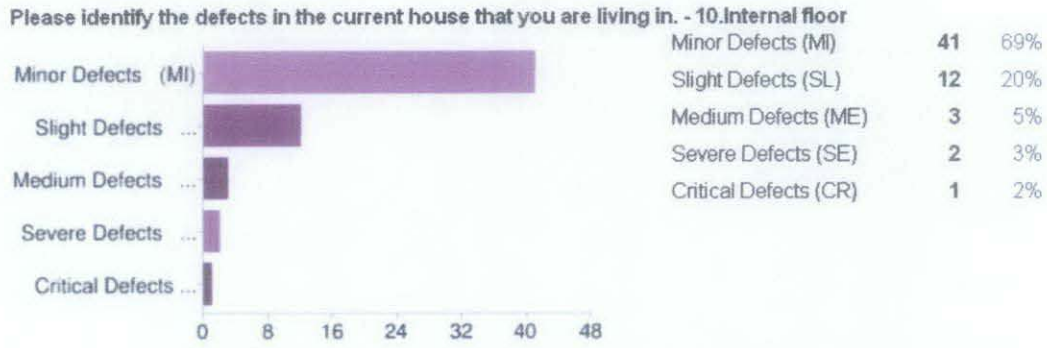

Figure 4.15: Level of Defect in Building Element for Internal Floor

4.2.2 Slight Defects that Affect the Aesthetic Value

From the result in figure 4.16 – figure 4.20 below, there are slight defects that affect the aesthetic value which are external wall, external floor, ceiling, sanitary equipment and plumbing facilities.

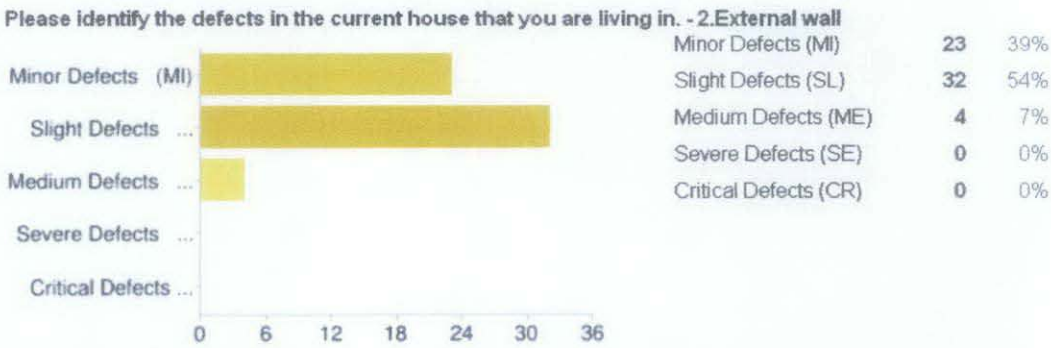

Figure 4.16: Level of Defect in Building Element for External Wall

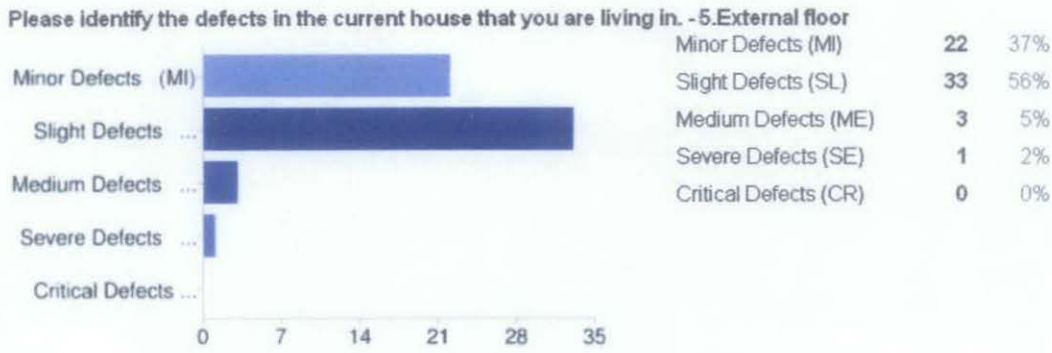

Figure 4.17: Level of Defect in Building Element for External Floor

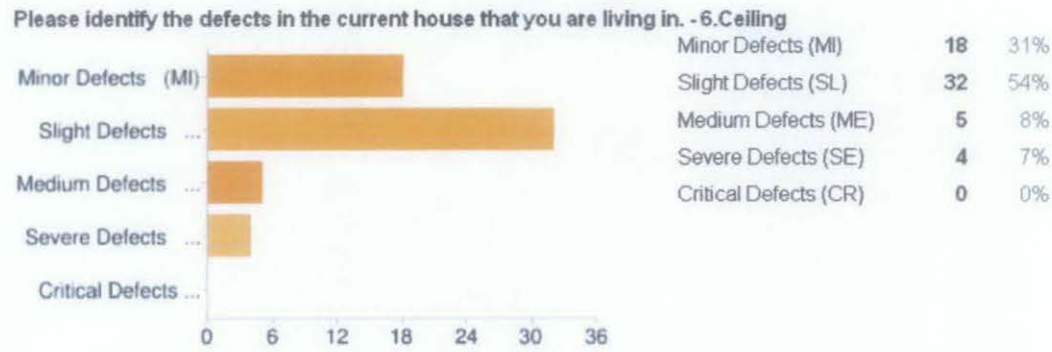

Figure 4.18: Level of Defect in Building Element for Ceiling

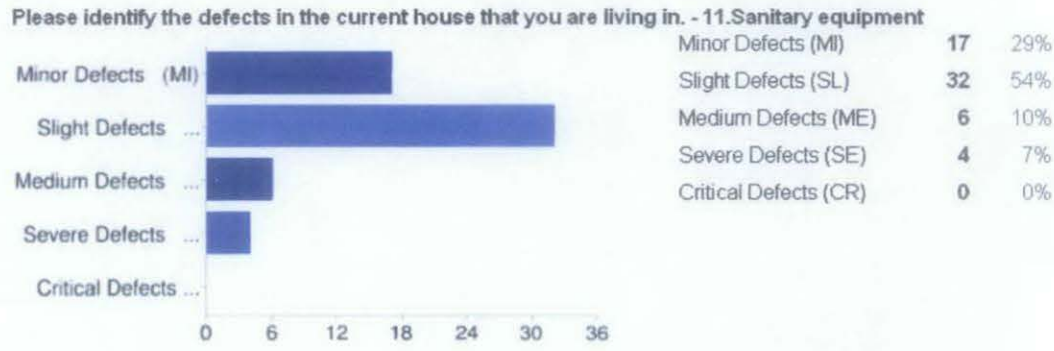

Figure 4.19: Level of Defect in Building Element for Sanitary Equipment

Figure 4.20: Level of Defect in Building Element for Plumbing Facilities

4.2.3 Medium Defects that Affect the Aesthetic Value and User Comfort

However, from the result in figure 4.21 below, there is only one case that has medium defect that affects the aesthetic value and user comfort which is electricity installation.

Figure 4.21: Level of Defect in Building Element for Electricity Installation

4.2.4 Severe Defects that Affect the User Comfort and Endanger Health and Safety and May Also cause Minor Accidents

Nevertheless, from the result in figure 4.22 and 4.23 below, there are 2 cases with severe defects that affect the user comfort and endanger health and safety and may also cause minor accidents which are water service and drainage system.

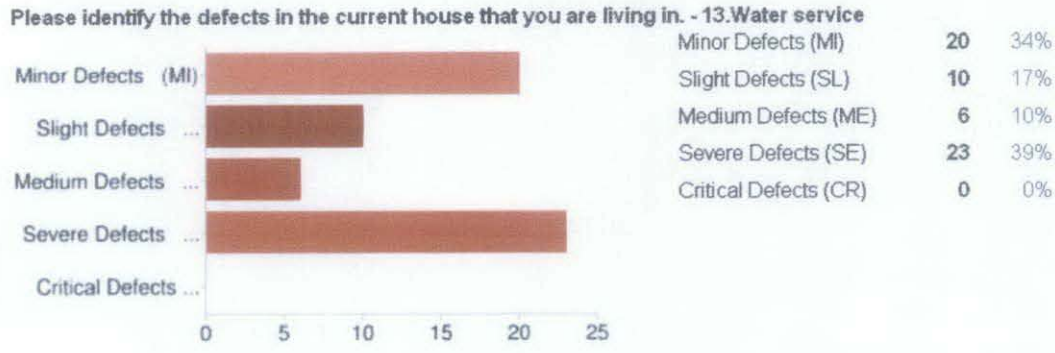

Figure 4.22: Level of Defect in Building Element for Water Service

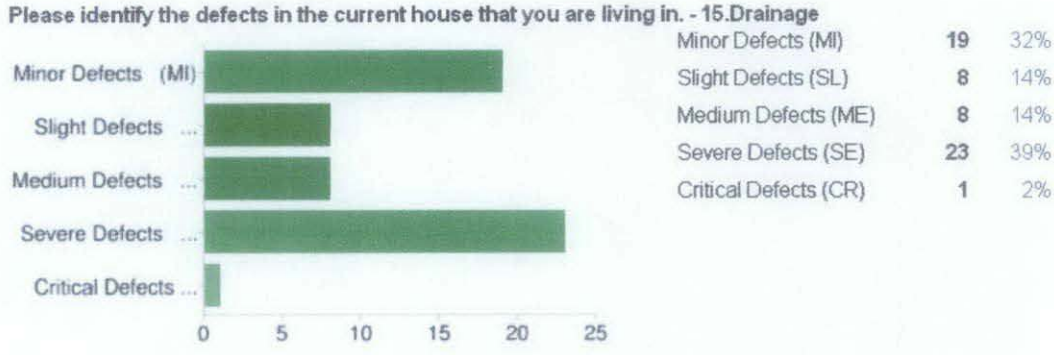

Figure 4.23: Level of Defect in Building Element for Drainage

4.2.5 Critical Defects that Endanger Health or Safety and May Cause Major Accidents

There is no critical defect based on the result obtained.

4.2.6 Comments from Respondents about Housing Defect in Malaysia

In addition, there are also comments from respondents about housing defect in Malaysia as listed below:

a) House owner shall do regular maintenance to keep the house at tip top conditions, especially house with more than 15years age.

b) Housing defects can be overcome by regular inspection or schedule maintenance by the authority.

c) Quality Assurance and Quality Check needs to be taken seriously by the Contractor. This will reduce the number of defects on building.

4.2.7 Summary of the Defect Level Based on Common Types of Housing Defect that Appear in Malaysia by Using Defect Index (DI) Method

Table 4.1: Summary of the Defect Level Based on Common Types of Housing Defect that Appear in Malaysia by Using Defect Index (DI) Method

	Defects				
Building Elements	**Minor**	**Slight**	**Medium**	**Severe**	**Critical**
1. Roof	√				
2. External Wall		√			
3. Windows	√				
4. External doors	√				
5. External floor		√			
6. Ceiling		√			
7. Stairs	√				
8. Internal Wall	√				
9. Internal Doors	√				
10. Internal Floor	√				
11. Sanitary equipment		√			
12. Electricity services			√		
13. Water supply				√	
14. Plumbing facilities		√			
15. Drainage				√	
Total	**7**	**5**	**1**	**2**	**0**

Table 4.1 shows the Summary of the Defect Level Based on Common Types of Housing Defect that Appear in Malaysia by Using Defect Index (DI) Method.

There are minor defects that no defects or defects without noteworthy on 7 building elements which are roof, windows, external doors, stairs, internal walls, internal doors and internal floor.

There are slight defects that affect the aesthetic value on 5 building elements which are external wall, external floor, ceiling, sanitary equipment and plumbing facilities.

There is only one case that has medium defect that affects the aesthetic value and user comfort on 1 building elements which is electricity installation.

There are 2 building elements with severe defects that affect the user comfort and endanger health and safety and may also cause minor accidents which are water service and drainage system.

There is no critical defect based on the result obtained.

4.3 Pivot Table and Pivot Chart

From the overall result, the Pivot Chart that are created to show the correlation between these elements which are:

a) Current House that They live-in

Based on the large number of respondents are from Kuala Lumpur and Perak, these 2 states are chosen.

b) Types of Current Houses

With the large number of respondents are staying in Terrace Houses and Apartment, there 2 type of houses are chosen.

c) Duration of Staying

Most of the respondents are staying for less than 5 years and in between 5 – 15 years ranges.

d) First Person To Living Since The House Was Built

This is to check the exact age range of the houses based on type of the houses. For example refer to the table 4.2 in section 4.3.1, people who live in Kuala Lumpur they are the first person living in their current house which duration of staying is less than 5 years. So, this house is less than 5 years age.

e) Elements of The Building

The elements with medium and severe defect are chosen which are Electricity for medium defect and Water service and Drainage for severe defects.

4.3.1 Summary of Pivot Table and Pivot Chart

The summary of the overall result are shown in table 4.2 and figure 4.24.

Table 4.2: Pivot Table

Current house that live-in	Type of current houses	Duration of Staying	First person to living since the house was built?	Electricity installation	Water service	Drainage
Kuala Lumpur	Terrace Houses	Less than 5 years	Yes	Severe	Severe	Medium
Perak	Apartments	5 – 15 years	No	Medium	Severe	Severe
			Yes	Medium	Severe	Severe
	Terrace Houses	5 – 15 years	No	Medium	Severe	Severe
			Yes	Medium	Severe	Severe

There are 2 main points to be concluded as a summary below:

a) For the only terrace houses that were built in Kuala Lumpur for less than 5 years, there are severe defects on Electricity Installation and Water service but there is a medium defect on Drainage.

b) For the apartments and terrace houses that were built in Perak for more than 5 years but less than 15 years, there is a medium defect on Electricity Installation but there are severe defect on Water service and Drainage.

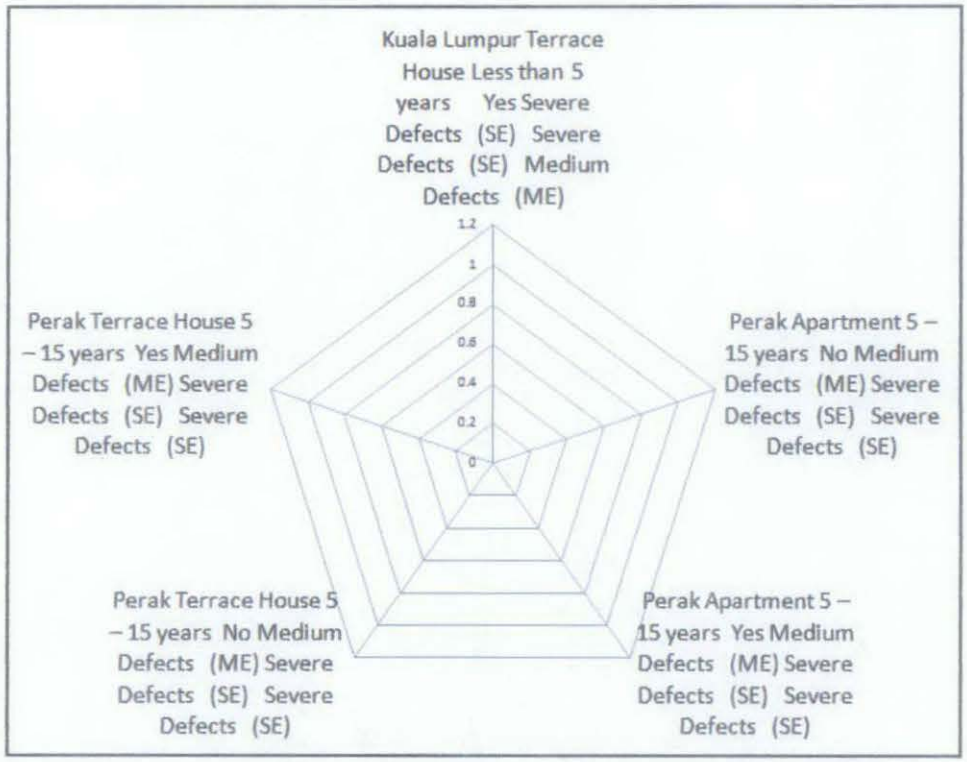

Figure 4.24: Pivot Chart

CHAPTER 5
CONCLUSION AND RECOMMENDATION

The main contribution of this paper is to furthering the use of the DI method proposed by Pedro (2008) to be a framework of tropical housing. The five scales of defects utilized in Pedro's (2008) study is adopted to analyze the level of housing defects that appear in Malaysia. Fifteen (15) important housing elements have been chosen to be assessed using the scale. The fifteen (15) important housing elements are: roof; external and internal doors; windows; external and internal floor; ceiling; stairs; external and internal wall; sanitary equipment; electricity service and water service; plumbing facilities and drainage.

There are 2 main points to be concluded as a summary below:

a) For the only terrace houses that were built in Kuala Lumpur for less than 5 years, there are severe defects on Electricity Installation and Water service but there is a medium defect on Drainage.
b) For the apartments and terrace houses that were built in Perak for more than 5 years but less than 15 years, there is a medium defect on Electricity Installation but there are severe defect on Water service and Drainage.

The result of this study can be used to assist contractors and developers to concern more on particular building elements that have medium to high level of defects based on Defect Index (DI). Improvement should take place on the elements that have severe defects which are water service and drainage system and also for the elements that have medium defect which is electricity installation. This improvement is for the better quality of the houses and will decrease the house users' complaint.

There are some recommendations toward house owner, contractors and local authority as listed below:

a) House owner shall do regular maintenance to keep the house at tip top conditions, especially house with more than 15years age.
b) Housing defects can be overcome by regular inspection or schedule maintenance by the local authority.
c) Quality Assurance and Quality Check needs to be taken seriously by the Contractor. This will reduce the number of defects on building.

The study use Microsoft Excel and Google Docs Online Survey for statistical method. For further recommendation of this method is to use advance statistical tool such as SPSS to produce the advance result.

The study has some remarkable limitations which deserve further improvement. Because there are limited projects that fulfill the research criteria at the time we carry out the study, and not all participants in MAPEX are willing to participate, also the project is not covered other major cities in Malaysia. For future studies, a good recommendation would be to cover other areas or states especially in the major cities where there is a possibility to have more home buyers participate in MAPEX, so that clear distinction can be seen in terms of defects level for all over Malaysia. Our study has leant on information gathered from the perspectives of occupiers. Other methods which collect data from the professional points of view may add interesting information about the defect level to be more accurate than this study.

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APPENDICES

APPENDIX A: SCHEDULE OF MAPEX 2011

MALAYSIA PROPERTY EXPO 2011

NATIONWIDE SCHEDULE

State	Venue	Dates
Kelantan	KB Mall, Kota Bahru, Kelantan	13 - 16 March
Klang Valley	Mid Valley Exhibition Centre (MVEC)	18 - 20 March
Melaka	Mahkota Parade	15 - 17 April
Pahang	East Coast Mall	15 - 17 April
Johor	Johor Bahru City Square (Atrium)	5 - 8 May
Negeri Sembilan	Seremban Parade Shopping Complex	20 - 22 May
Kedah / Perlis	Alor Star Mall, Alor Star	26 - 29 May
Kedah / Perlis	Central Square, Sungai Petani	2 - 5 June
Kedah / Perlis	Kulim Landmark Central, Shopping Centre, Kulim	9 - 12 June
Perak	Stadium Indera Mulia, Ipoh	23 - 26 June
Klang Valley	Hall 4, Putra World Trade Centre (PWTC)	1 - 3 July
Melaka	Mahkota Parade	15 - 17 July
Pahang	Berjaya Megamall	22 - 24 July
Klang Valley	Mid Valley Exhibition Centre (MVEC)	21 - 23 October
Pahang	Kuantan Parade, Kuantan	28 - 30 October
Melaka	MYDIN Ayer Keroh, Melaka	18 - 20 November
Johor		24 - 27 November

** MAPEX dates for other states will be updated as soon as they are confirmed.*

Source: http://www.rehda.com/mapex/index.html

APPENDIX B: QUESTIONNAIRE SAMPLE

University Technology PETRONAS
Questionnaire No. _____

HOUSING DEFECTS QUESTIONNAIRE

Please indicate your answers by ticking (/) in the box below.

A. RESPONDENT'S BACKGROUND

1. Gender: ☐ Male ☐ Female
2. Occupation: ☐ Contractor ☐ Consultant ☐ Others (please specify) .....
3. Monthly income:
   ☐ < RM2,000 ☐ RM 2,000 - RM4,000 ☐ RM4,000 - RM6,000 ☐ > RM6,000
4. Specify current city that you live-in: .....
5. Type of current house (building) that you are staying:
   ☐ Hotel ☐ Condo ☐ Apartment ☐ Flat ☐ Terrace houses
   ☐ Others (please specify) .....
6. How long have you been staying in your current house?
   ☐ < 5 years ☐ 5 – 15 years ☐ 15 – 30 years ☐ > 30 years
7. Are you the first person that came to live in the current house since the house was built?
   ☐ Yes ☐ No
8. Status of your tenancy : ☐ Owner Staying ☐ Tenant

B. DEFECTS IN BUILDING ELEMENTS

Please identify the defects in the current house that you are living in.

Notes: Minor Defects (MI) : No defects or defects *without noteworthy*
Slight Defects (SL) : Defects that affect the *aesthetic values*
Medium Defects (ME): Defects that affect the *aesthetic values* and *user comfort*
Severe Defects (SE) : Defects that affect the *user comfort* and endanger *health* & *safety* and may cause *minor accidents*
Critical Defects (CR): Defects that endanger *health* & *safety* and may cause *major accidents*

	Defects					
	Minor (MI)	Slight (SL)	Medium (ME)	Severe (SE)	Critical (CR)	Remark
Building Elements						
1. Roof	☐	☐	☐	☐	☐	
2. External wall	☐	☐	☐	☐	☐	
3. Windows	☐	☐	☐	☐	☐	
4. External doors	☐	☐	☐	☐	☐	
5. External floor	☐	☐	☐	☐	☐	
6. Ceiling	☐	☐	☐	☐	☐	
7. Stairs	☐	☐	☐	☐	☐	
8. Internal wall	☐	☐	☐	☐	☐	
9. Internal doors	☐	☐	☐	☐	☐	
10. Internal floor	☐	☐	☐	☐	☐	
11. Sanitary equipment	☐	☐	☐	☐	☐	
12. Electricity installation	☐	☐	☐	☐	☐	
13. Water service	☐	☐	☐	☐	☐	
14. Plumbing facilities	☐	☐	☐	☐	☐	
15. Drainage	☐	☐	☐	☐	☐	

Please state any comment:

_____

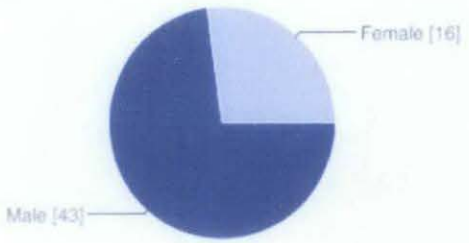
_____

APPENDIX C: SURVEY RESULT

A. RESPONDENT'S BACKGROUND

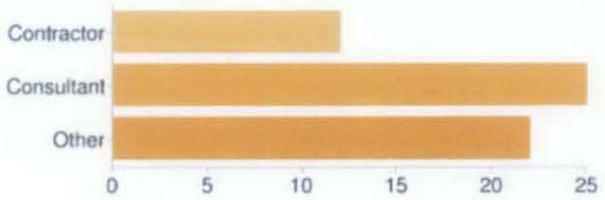
Please indicate your answers below

1. Gender:



Male	**43**	73%
Female	**16**	27%

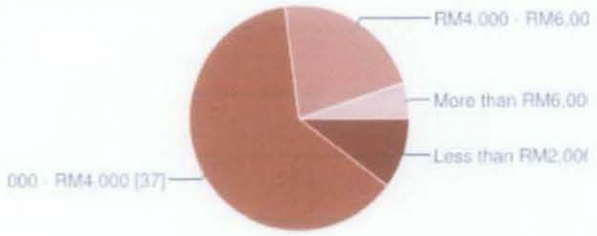
2. Occupation:



Contractor	**12**	20%
Consultant	**25**	42%
Other	**22**	37%

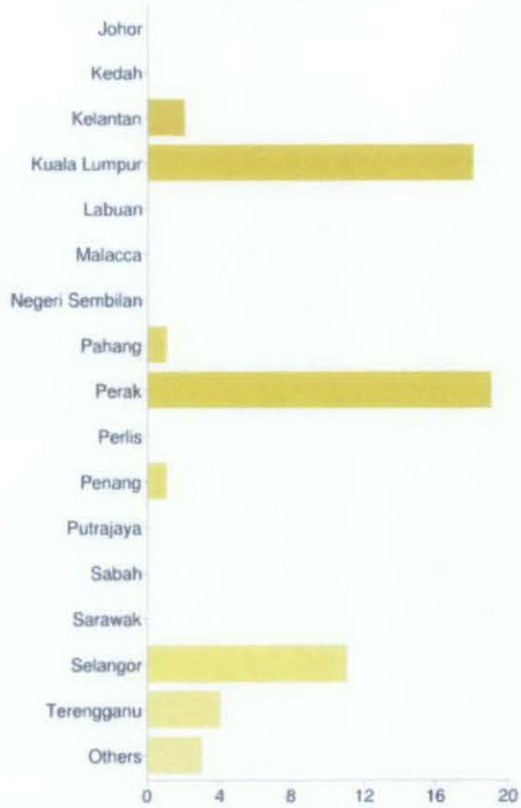
People may select more than one checkbox, so percentages may add up to more than 100%.

3. Monthly income:



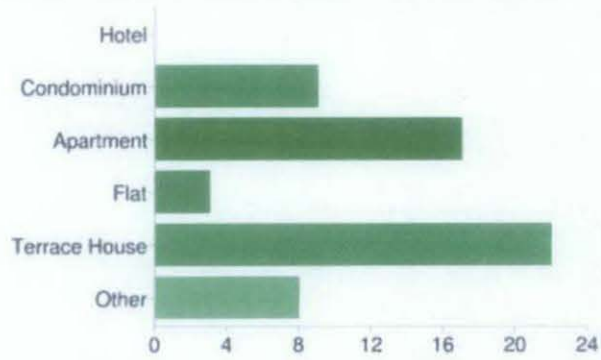
Less than RM2,000	**6**	10%
RM 2,000 - RM4,000	**37**	63%
RM4,000 - RM6,000	**13**	22%
More than RM6,000	**3**	5%

4. Specify the current house that you live-in:



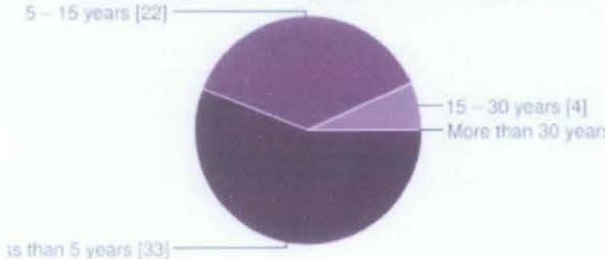
Johor	0	0%
Kedah	0	0%
Kelantan	2	3%
Kuala Lumpur	18	31%
Labuan	0	0%
Malacca	0	0%
Negeri Sembilan	0	0%
Pahang	1	2%
Perak	19	32%
Perlis	0	0%
Penang	1	2%
Putrajaya	0	0%
Sabah	0	0%
Sarawak	0	0%
Selangor	11	19%
Terengganu	4	7%
Others	3	5%

5. Type of current house (building) that you are staying:



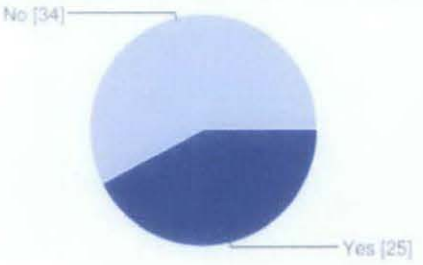
Hotel	0	0%
Condominium	9	15%
Apartment	17	29%
Flat	3	5%
Terrace House	22	37%
Other	8	14%

6. How long have you been staying in your current house?



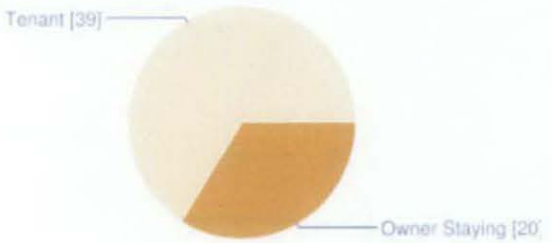
Less than 5 years	33	56%
5 – 15 years	22	37%
15 – 30 years	4	7%
More than 30 years	0	0%

7. Are you the first person that came to live in the current house since the house was built?



Yes	25	42%
No	34	58%

8. Status of your tenancy :



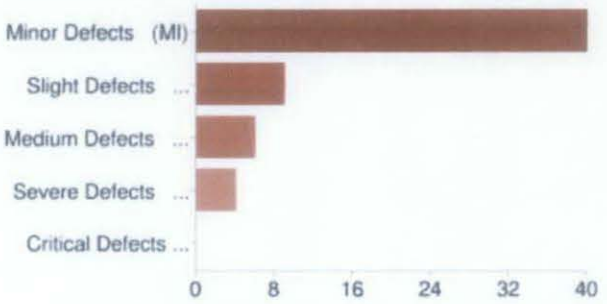
Owner Staying	20	34%
Tenant	39	66%

B. DEFECTS IN BUILDING ELEMENTS

Notes:

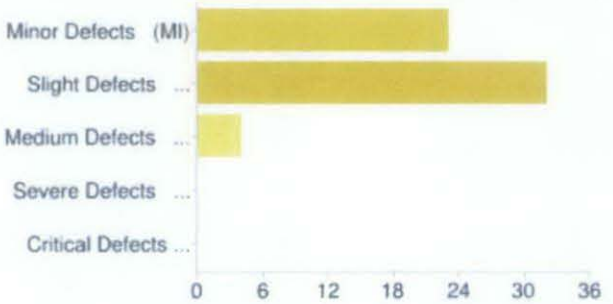
Minor Defects (MI) : No defects or defects without noteworthy Slight Defects (SL) : Defects that affect the aesthetic values Medium Defects (ME) : Defects that affect the aesthetic values and user comfort Severe Defects (SE) : Defects that affect the user comfort and endanger health & safety and may cause minor accidents Critical Defects (CR) : Defects that endanger health & safety and may cause major accidents

Please identify the defects in the current house that you are living in. - 1.Roof



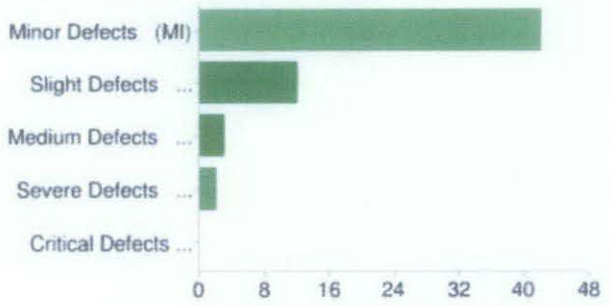
Minor Defects (MI)	40	68%
Slight Defects (SL)	9	15%
Medium Defects (ME)	6	10%
Severe Defects (SE)	4	7%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 2.External wall



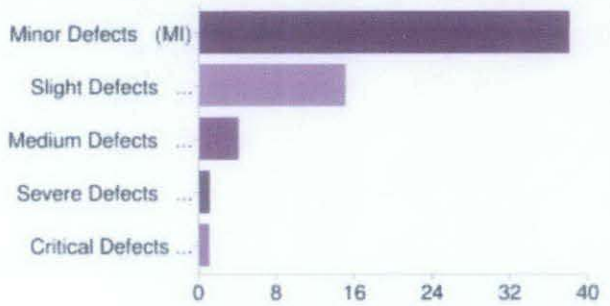
Minor Defects (MI)	23	39%
Slight Defects (SL)	32	54%
Medium Defects (ME)	4	7%
Severe Defects (SE)	0	0%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 3.Windows



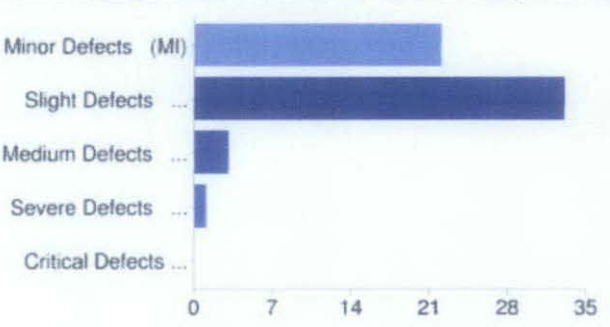
Minor Defects (MI)	42	71%
Slight Defects (SL)	12	20%
Medium Defects (ME)	3	5%
Severe Defects (SE)	2	3%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 4.External doors



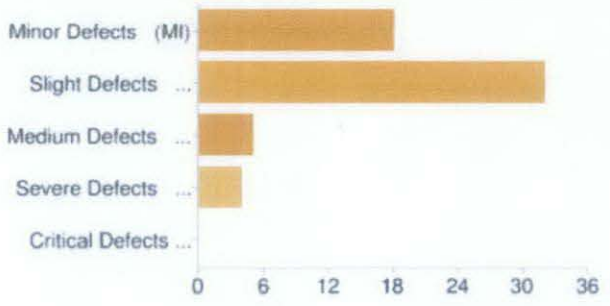
Minor Defects (MI)	38	64%
Slight Defects (SL)	15	25%
Medium Defects (ME)	4	7%
Severe Defects (SE)	1	2%
Critical Defects (CR)	1	2%

Please identify the defects in the current house that you are living in. - 5.External floor



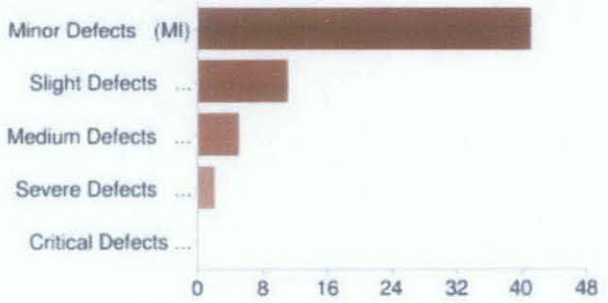
Minor Defects (MI)	22	37%
Slight Defects (SL)	33	56%
Medium Defects (ME)	3	5%
Severe Defects (SE)	1	2%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 6.Ceiling



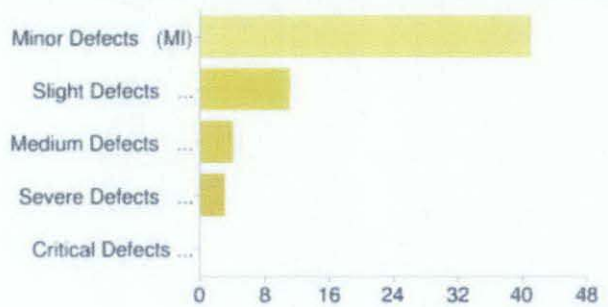
Minor Defects (MI)	18	31%
Slight Defects (SL)	32	54%
Medium Defects (ME)	5	8%
Severe Defects (SE)	4	7%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 7.Stairs



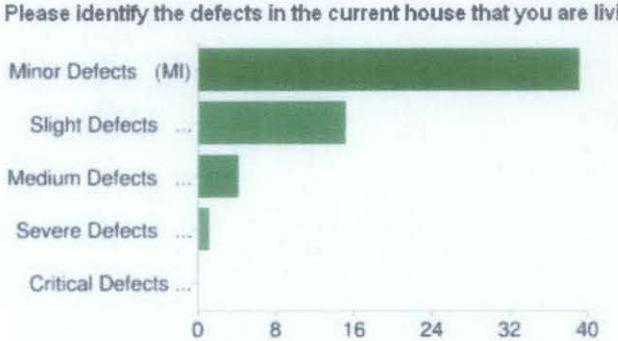
Minor Defects (MI)	41	69%
Slight Defects (SL)	11	19%
Medium Defects (ME)	5	8%
Severe Defects (SE)	2	3%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 8.Internal wall



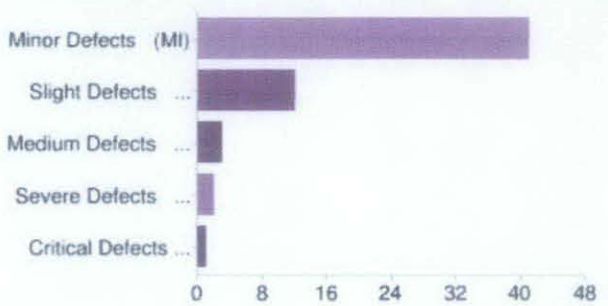
Minor Defects (MI)	41	69%
Slight Defects (SL)	11	19%
Medium Defects (ME)	4	7%
Severe Defects (SE)	3	5%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 9.Internal doors



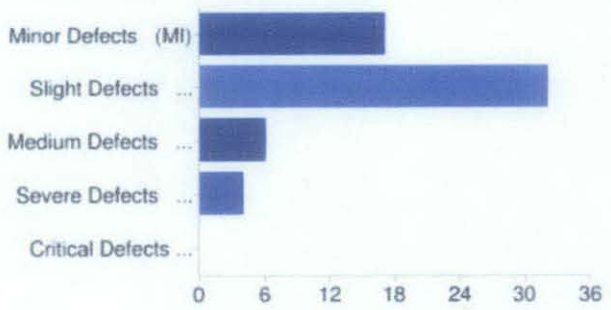
Minor Defects (MI)	39	66%
Slight Defects (SL)	15	25%
Medium Defects (ME)	4	7%
Severe Defects (SE)	1	2%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 10.Internal floor



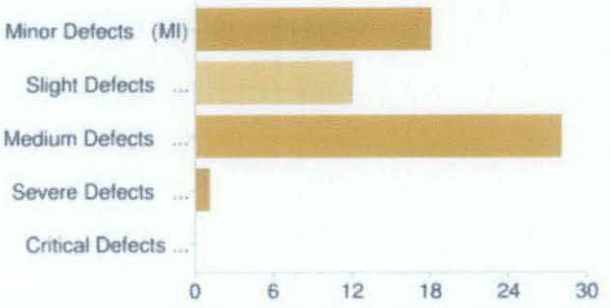
Minor Defects (MI)	41	69%
Slight Defects (SL)	12	20%
Medium Defects (ME)	3	5%
Severe Defects (SE)	2	3%
Critical Defects (CR)	1	2%

Please identify the defects in the current house that you are living in. - 11.Sanitary equipment



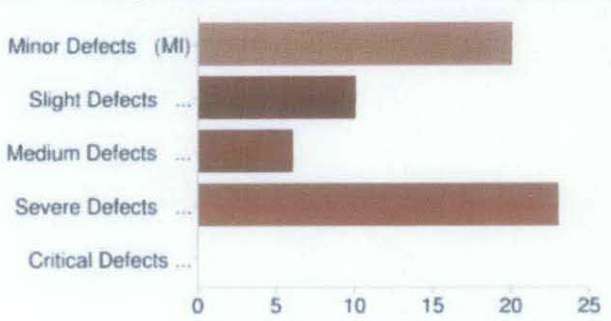
Minor Defects (MI)	17	29%
Slight Defects (SL)	32	54%
Medium Defects (ME)	6	10%
Severe Defects (SE)	4	7%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 12.Electricity installation



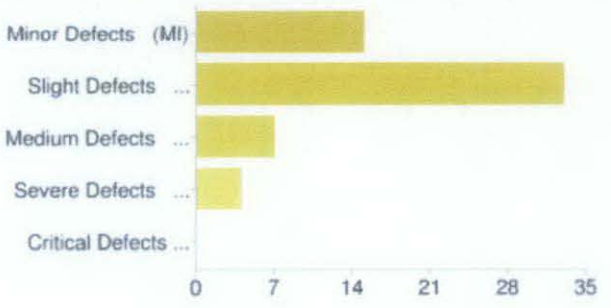
Minor Defects (MI)	18	31%
Slight Defects (SL)	12	20%
Medium Defects (ME)	28	47%
Severe Defects (SE)	1	2%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 13.Water service



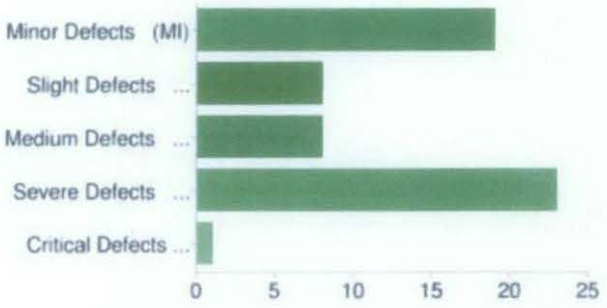
Minor Defects (MI)	20	34%
Slight Defects (SL)	10	17%
Medium Defects (ME)	6	10%
Severe Defects (SE)	23	39%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 14.Plumbing facilities



Minor Defects (MI)	15	25%
Slight Defects (SL)	33	56%
Medium Defects (ME)	7	12%
Severe Defects (SE)	4	7%
Critical Defects (CR)	0	0%

Please identify the defects in the current house that you are living in. - 15.Drainage



Minor Defects (MI)	19	32%
Slight Defects (SL)	8	14%
Medium Defects (ME)	8	14%
Severe Defects (SE)	23	39%
Critical Defects (CR)	1	2%

Please give any recommendations about housing defects (if any)

house owner shall do regular maintenance to keep the house at tip top conditions, especially house with more than 15 years age. Housing defects can be overcome by regular inspection or schedule maintenance by the authority. there are no significant defect observed. everything is just fine. Good. no. Quality Assurance and Quality Check needs to be taken seriously by the Contractor. This will reduce the number of defects on building.