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INVESTIGATING FACTORS CAUSING DEFECTS IN INDUSTRIALISED BUILDING SYSTEM (IBS) IMPLEMENTATION FOR THE PEOPLE'S HOUSING PROGRAMME (PPR) IN PARIT BUNTAR, PERAK

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Abstract: *Industrialised Building Systems (IBS), or prefabrication, involves off-site manufacturing of components for easy installation. However, IBS faces challenges in Malaysia due to inadequate risk management, resulting in common failures. This paper objectives are to identify the types of defects and to analyse the causes of defects in the IBS project at PPR Parit Buntar, Perak housing. Questionnaires from 80 residents were analysed, revealing roof leaks as the primary defect. Interestingly, residents expressed high satisfaction with the quality of the house space. The findings also indicated that natural phenomena were the main contributors to defects in PPR housing. To enhance long-term satisfaction, it is recommended for housing developers and contractors to prioritize higher-quality materials in IBS projects.*

Keywords: *Industrialised Building Systems (IBS), defects, People Housing Program (PPR), satisfaction, defects contributors*

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Introduction

Industrialised Building Systems (IBS), also known as prefabrication, involves the manufacture of components off-site ready for installation. The manufacturing of components was done in the factory and the components simply needed to be delivered to the construction site for assembly and erection. However, despite the possible defects. IBS components remain undoubtedly beneficial as its technology is already implemented regularly in other developing countries. (Hassim et. al., 2009) cited those other developing countries such as Germany, Japan, Singapore, Sweden, and the United Kingdom keep forward on using IBS construction technology to emerging countries. According to (Ismail and Rahim, 2009), IBS factory manufactured components are easy to assemble on site, use less labour, faster to construct and are of high quality. However, according to (Salihudin H. et al., 2009), since the first project of IBS in 1964 till today, IBS in Malaysia is not well accepted by the construction parties because of failure to adequately deal with risks in the IBS projects. This is due to the fact that failures in IBS projects are still common in Malaysia. For instance, the technical risk and quality risks in IBS such as cracks, functional faults and others.

The Malaysian government has actively mandated the Industrialised Building System (IBS) to enhance construction productivity, quality, and delivery speed, especially within the People's Housing Programme (PPR) framework. Despite its recognized advantages over conventional methods, the adoption rate faces persistent reluctance due to quality-related risks and post-construction defects. In precast concrete wall systems, critical issues such as joint seal failures, water percolation, and superficial cracking frequently emerge during the operational phase, undermining residents' satisfaction. While extensive literature examines the macro-level adoption barriers of IBS, empirical investigations evaluating the actual prevalence of physical defects and their underlying causal factors within occupied low-cost housing schemes remain sparse. Furthermore, an apparent disconnect often exists between occupant perception and technical defect causation. Therefore, this study addresses this empirical gap by systematically investigating the specific typologies of defects and analysing their primary contributors at PPR Parit Buntar, Perak.

Despite being manufactured to high quality standards, defects can still occur in Industrialized Building System (IBS) projects. Chong and Low (2006) identified various factors contributing to defects, including civil design, architectural design, maintenance practicability, consultant firm administration, construction drawings, contractor administration, construction materials, construction equipment, and specifications. Stephenson et al. (2002) categorized the sources of defects as natural occurrences, design errors, craftsmanship errors, defective materials, construction faults, inadequate maintenance, and user activity or misuse. In addition, Olenwaju et al. (2022) stated that common defects in affordable housing include dampness, peeling paint, cracks, fungus growth, discoloration, roof leaks, damaged kitchen basin, damaged doors, broken windows, and others. N. Ahzahar et al. (2011) identified defects such as blemishes, steel corrosion, dampness, peeling paint, roof defects, cracks, spalling or chipping, foundation failure, damage to exterior surfaces, and structural instability. Furthermore, several researchers revealed that Residents of low-cost houses, like PPR housing in Malaysia, often express dissatisfaction with both public facilities and the houses themselves. lsnin et al. (2012) found that residents are dissatisfied with building services facilities in their neighborhood, while Chang (2013) reported numerous complaints from purchasers about defects in newly purchased units. Adequate housing facilities and common amenities such as education, healthcare, transportation, markets, community halls, mailing systems, parking spaces, and playgrounds are essential for daily life.

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The sources of defects can be categorised as natural occurrences, design error, craftsmanship error, defective material, procedural or construction faults, improper maintenance neglect, and user activity, abuse, or misuse of the structure (Stephenson et al., 2002). According to Khotamov A and Kadabayeva, S. (2023) defect happens due to poor performance and a lack of scheduled preventive maintenance. This corresponds with Lambers, R., et al. (2023) one of the causes of defects occurring is caused by workers taking shortcuts in completing their tasks during construction work. The aim of this research paper is to study the defects in the Industrialised Building System (IBS) project in PPR Parit Buntar, Perak. To obtain this aim, the objectives are:

I. To identify the types of defects of the Industrialised Building System (IBS) for residential PPR housing in Parit Buntar, Perak.
II. To analyse the factors of defect in Industrialised Building System (IBS) implemented for residential PPR housing in Parit Buntar, Perak.

Literature Review

The Industrialised Building System is a way to build that involves making parts in a controlled environment. Depending on the part being made or the type of building being built, the controlled environment can be on-site or off-site. The Malaysian term for prefabricated construction, or "pre-fab" for short, is "Industrialised Building System." This term is used in the Malaysian construction industry. Its use has grown in the construction industry around the world. In Malaysia, the system is often used in both residential and business developments.Construction Industry Development Berhad (CIDB) says that IBS is a method of building in which building parts are made in factories or elsewhere, transported, and then put together with as little work as possible. There are six main IBS groups that are commonly used in Malaysia. These are precast concrete framing, panel and box systems, steel formwork system, steel framing system, blockwork system, and innovative system.

IBS was first used in Malaysia in 1963. When the Tunku Abdul Rahman Public Housing Estate, also known as the Pekeliling Flats, was finished almost forty years ago, it was the first time that prefabrication was used in Malaysia. Even though IBS has been in Malaysia for 40 years, it is still not widely used in the construction industry, especially in the private sector, compared to other developed countries. In any case, the Malaysian government thinks that IBS is the way forward in the construction business. 1999 saw the start of the IBS Strategic Plan, and 2003 saw the IBS Roadmap 2003-2010.

Also, the government has told government projects that they must have at least 70% IBS content. According to Othuman Mydin et al. (2014), despite the fact that many contractors are aware of and concur with the benefits of I8S, they prefer conventional construction because they believe it to be the safest option, despite its high cost and length of time. In conclusion, they prefer the conventional method because they are unwilling to accept the risk of using I8S in their projects, which they perceive to be significantly safer than IBS.

In addition, for this project scheme, the types of IBS is precast concrete wall system.

Types Of Defects

A defect is a building flaw or architectural error that decreases the building's value and creates a hazardous condition. Often, a defect is shown as a deficiency, injury, default, or absence (Olanrewaju & Abdul Aziz, 2015). In addition, flaws are incorrect conditions that may influence the building's structural integrity, resulting in poor quality and performance (Burden 2004). According to Olenwaju, et. al. (2022), there are several types of defects that are

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commonly addressed in affordable housing houses such as dampness, peeling paint, cracks, growth of fungus, discoloration, roof leaks, damaged kitchen basin, damaged doors, broken windows and others. Like with other construction projects, defects can occur in I8S-based construction. According to Bakri and Mydin (2004), building defects can emerge in both old and new structures based on their upkeep, wear and tear, degradation, and overuse.



Figure 1: Peeling paint

On walls that have been thoroughly plastered, peeling paint is a common occurrence (Ahmad, 2004). In addition, building columns and other components of the structure that are exposed to sunlight and water will also cause paint to peel. Plus, the paint's quality is essential for the building because it affects the paint's deterioration. Nippon Paint and Jotun are superior paints that will prevent the wall surface from deteriorating more rapidly (Low and Mydin, 2012). Also, the paint can be removed off the wall if a particular type of paint is utilised. This is because each paint contains unique ingredients or chemicals. In this way, the paint would begin to peel.



Figure 2: Roof leakage

According to Chong, W., and Low, S. (2005), he discovered that reducing roof faults can minimize the likelihood of roof leaks and extend the roofs lifespan. The main problem for the roof is water infiltration, which results in leaking. Often, roof faults are caused by open penetration, missing roof tiles, or incorrect underlayment installation. Moreover, roof leaks can create ceiling and drywall discoloration. Moisture is visible wherever there is a stain, and it will begin to destroy the wood frame, thus weakening the structural integrity. Mold can also grow on walls if moisture is present for extended periods of time.

Causes Of Defects

The sources of defects can be categorised as natural occurrences, design error, craftsmanship error, defective material, procedural or construction faults, improper maintenance neglect, and user activity, abuse, or misuse of the structure (Stephenson et al., 2002). According to (Khotamov A. and Kadabayeva, S., 2023) defect happens due to poor performance and a lack of scheduled preventive maintenance. This corresponds with (Lambers, R., et al., 2023) one of the causes of defects occurring is caused by workers taking shortcuts in completing their tasks during construction work. (Chong and Low, 2006) stated that a survey on 11 major groups of

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defects revealed that defects were caused by civil design, architectural design, design issues on maintenance practicability and adequacy, defects due to consultant firm administration and staff, defects due to construction drawings, defects due to contractor administration, defects due to construction materials, defects due to construction equipment, and defects due to specifications. According to (Rhodes and Smallwood, 2002), the source of a fault can be traced back to the design, construction, procurement, and environmental circumstances at the time.

Research Methodology

This research adopted a quantitative empirical approach via a structured cross-sectional questionnaire survey. The target population comprised residents of the People's Housing Programme (PPR) in Parit Buntar, Perak, a residential scheme constructed utilizing a precast concrete wall panel system. The building's operational lifespan of two to five years offers an ideal timeframe for evaluating latent defects and post-occupancy performance.

The sampling frame was determined based on established statistical sampling principles. Out of 100 distributed questionnaires, 80 completed and valid responses were retrieved, yielding an 80% response rate. The survey instrument was divided into four core sections: Section A captured demographic parameters; Section B evaluated occupants' foundational knowledge of IBS and captured the empirical incidence of building defects across multiple typologies (e.g., dampness, crack formation, roof leaks); Section C operationalized defect causation factors derived from established frameworks (design deficiency, workmanship error, substandard materials, maintenance negligence, natural phenomena, and tenant modification); and Section D evaluated spatial and structural satisfaction.

Data analytical procedures were executed using IBM SPSS Statistics (Version 26.0) and Microsoft Excel. Descriptive frequency analysis was performed for categorical data, while the ranking of contributing defect factors was evaluated using relative percentage shares and ranking matrices to identify prevailing risk parameters."

Analysis Of Findings

This section explains analysis and findings from the observations. Generally, the section is divided into four parts:

(a) Demographic Information
(b) Defects In IBS Projects In Perak
(c) What is The Factors That Contribute To Defect In IBS Project

Table 1: Section A: Demographic Information

Item	Demographic Factor		frequency	Percentage %
Q1.	Gender	Male	53	66.3
		Female	27	33.8
Q2.	Age	< 35 years	47	58.8
		36 years - 56 years	32	40
		> 56 years	1	1.3
Q3.	Status	Married	75	93.8
		Single	5	6.3
Q4.	Ethnic	Malay	80	100
		Chinese	-	-
		India	-	-
		Others	-	-

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Q5.	Professional	Government	41	51.2
		Private	25	31.3
		Own	14	17.5
Q6.	How long do you live in this housing	< 1 years	15	18.8
		2 years - 5years	64	80
		> 6 years	1	1.3

Table 1 shows frequencies and percentages of respondents' gender. The result shows that from the 80 respondents, the majority of respondents are males (n=53, 66%) as opposed to females (n=26, 34%). It shows that most respondents participated in this survey are males. As for the second question, the table shows the frequency and percentages of respondent's age. The result shows that from 80 respondents, the majority of respondents are below 35 years old (n=47, 58%). The lowest is age above 56 years old (n= 1, 2%). This means that most of the respondents' age is below 35 years old.The third question is regarding the respondent's status. The result from table 1 shows that the majority of respondents participating in this survey are married (n=68, 85%). The second majority is single (n= 12, 15%). The fourth question under the demographic data was the respondent's ethnic. The result shows that from 80 respondents, the majority of respondents in that low cost house are Malay (n=80, 100%). No other ethics were found during my questionnaire distributions. Next, question fifth shows the respondent's profession. The result shows that from 80 respondents, the majority of respondents in that low cost house are working with the government (n=41, 51%). The second majority are working in the public sector (n=25, 31%). The lowest is own (n=14, 18%).

Table 1 shows the frequency and percentages of the sixth question, respondent's period of living in the area. The result shows that from the 80 respondents, the majority of respondents participating in this survey had lived for 2 to 5 years (n=64, 80%). The second majority is less than 1 year (n= 15, 18%). Lastly, table 4.2 shows the frequency and percentages of respondent's number of people living in the house. The result shows that from the 80 respondents, the majority of respondents have less than 5 people (n=44, 55%). The second majority is 5 to 7 people (n=28, 35%). The lowest frequency is more than 7 people (n=8, 10%).

Analysis of Defects in 1BS Projects in Perak

In section, all respondents were asked about basic knowledge of defects and 1BS as well as the type of defects that occurred in their house.

Table 2: Section B: Defects in 18S Projects in Perak

Item	Question		frequency	Percentage %
Q1.	Do you know wht is defects?	Yes	55	68.75
		No	25	31.25
Q2.	Can you explain whats is decets ?	Yes	47	58.8
		No.	32	40
		Not sure	22	27
Q3.	Do you know what is IBS?	Yes	44	55
		No.	27	33
		Not sure	8	12
Q4.	Can you explain what is IBS?	Yes	23	28
		No.	24	44
		Not sure	23	28

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Q5.	Which type of defects has occur in your house	Dampness	34	17
		Peeling paint	11	5
		Cracks	46	23
		Growth of fungus	4	2
		Discoloration	8	4
		Roof leaks	57	30
		Others	39	19

The first question in table 2 shows the frequency and percentages of respondent's understanding of what defect is. The result shows that from the 80 respondents, the majority of respondents participating in this survey chose 'yes' (n=55, 68.75%). Meanwhile, the other chose 'no' (n=25, 31.25%). The second question in table 1.2 shows the frequency and percentages of respondent's that can explain what defect is. The result shows that from the 80 respondents, the majority of respondents participating in this survey chose 'yes' (n= 36, 46%). Meanwhile, the 'no' and 'not sure' (n=22, 27%) options have the same frequencies. Next, table 2 shows the frequency and percentages of respondent's understanding of what 18S is. The result shows that from the 80 respondents, the majority of respondents participating in this survey chose 'yes' (n=44, 55%). The second majority choose the option 'no' (n=27, 33%). Meanwhile, the lowest is 'not sure' (n=8, 12%). The fourth question in table 2 shows the frequency and percentages of respondent's that can explain what 18S is. The result shows that from the 80 respondents, the majority of respondents participating in this survey chose 'no' (n=34, 44%). Meanwhile, the 'yes' and 'not sure' (n=23, 28%) options have the same frequencies.

Finally, the last question for this section was about the type of defects occurring in the house. Based on table 1.2, roof leaks (n=57, 30%) were the most found defects in their houses. While, cracks (n=46, 23%) are the second most occurring defects. The lowest defects found was growth of fungus (n=4, 2%).

Analysis Of the Causes That Contribute to Defect In IBS Project

Percentage of cases is used to report the data as it indicates the percentage of the data respondents that had selected the factors that contribute to defect in 1BS project. The data obtained were presented in a bar chart and table according to its rank. Figure 3 shows six (6) factors:

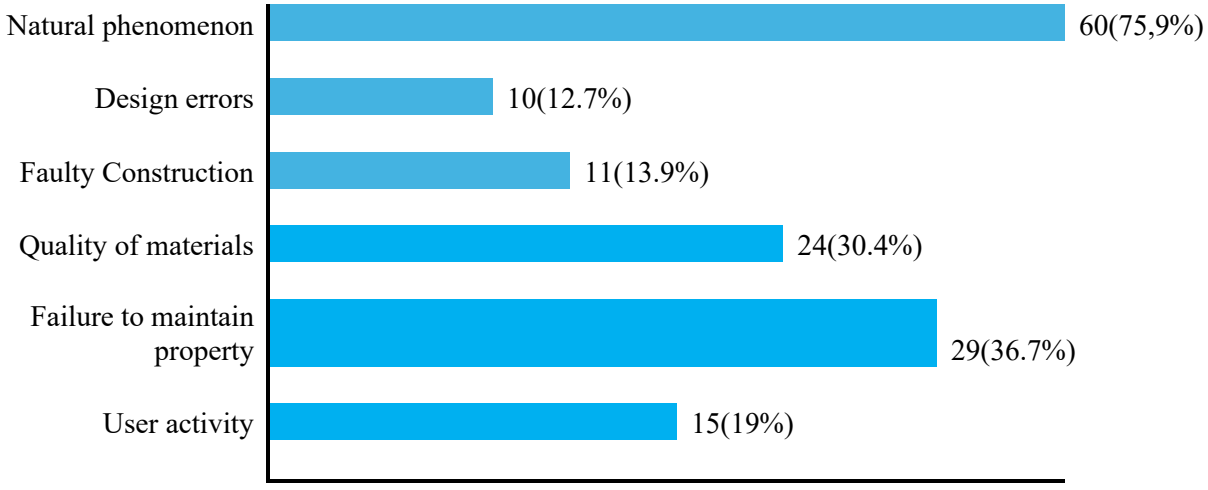


Figure 3: Causes that contribute to Defects in IBS Project

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The bar graph demonstrates the responses of the respondents regarding the main factors contributing to defects in IBS projects. The most chosen factor is natural phenomenon 60 respondents (75.9%) who agreed. The second highest factor chosen is failure to maintain properly 29 respondents (36. 7%). Meanwhile, 24 respondents (30.4%) chose faulty materials as the factors causing defects. Next, 15 respondents (19%) chose user activity abuse or misuse of the building as the factor. Lastly, faulty construction is chosen by 11 respondents (13.9%) and the lowest factor selected is design errors by 10 respondents (12.7%). From the responses, it can be said that all of these factors can contribute to the cause of defects in 185 projects.

Discussion Of Findings

There are 80 sets of questionnaires that have been completed and valid for analysis from the 100 set questionnaires which have been spread. Based on the overall analysis and study, the males are more than females in completing this survey. Furthermore, more than half of the age below 36 years old that completed this survey can be considered as the highest. Based on the responses given by the residents from PPR Parit Buntar project, the main type of defect that occur in their houses is roof leaks, followed by cracks, others(water tank leakage), dampness, peeling paint, discoloration and the least type of defect that occur in PPR Parit Buntar is growth of fungus. In this study there are six (6) causes that contribute to defects in the PPR Parit Buntar I8S project. Those factors include natural phenomenon, design errors, faulty construction, faulty materials since this PPR used precast concrete wall system as wall panel, failure to maintain properly and user abuse or misuse of the building. Based on the findings it shows that the highest selected factor that contributes to defects in PPR Parit Buntar is a natural phenomenon. Meanwhile, the least factor contributing to defects in PPR Parit Buntar is design errors.

Conclusion

It can be concluded that based on the objectives of this research, the following are the conclusion of the findings for this study. According to literature, the most frequently identified types of defects in IBS residential PPR housing are dampness, peeling paint and cracking. However, based on the responses given by the residents from PPR Parit Buntar project, the main type of 71 defect that occur in their houses is roof leaks, followed by cracks, others(water tank leakage), dampness, peeling paint, discoloration and the least type of defect that occur in PPR Parit Buntar is growth of fungus. Based on my observation, the reason peeling paint, discoloration and growth of fungus defect is rarely found in PPR Parit Buntar is due to the period of the building is only two years to five years old.Lastly, based on literature, natural occurrences, design error, craftsmanship error are the top three most cited as the causes of defect in IBS PPR housing, with 2 researchers supporting this claim. However, the findings reveal differently. In this study there are six (6) factors that contribute to defects in the PPR Seri lskandar IBS project. Those factors include natural phenomenon, design errors, faulty construction, faulty materials, failure to maintain properly and user abuse or misuse of the building. Based on the findings it shows that the highest selected factor that contributes to defects in PPR Parit Buntar is a natural phenomenon. Based on my observation the selected factor of natural phenomenon is not significant with the defect that most frequently happens in PPR Parit Buntar which is roof leakage. Meanwhile, the least factor contributing to defects in PPR Parit Buntar is design errors. This research can be widely studied on variety of defect for PPR. Because, most of the housing schemes for affordable housing used IBS as main materials such Shear wall, Acotec panel, Block wall, Ajiya lightweight frame and etc.. Therefore, each of materials has different pro and const which contribute to defects after completion.

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References

Abdullahi, M. R., Mohd, K., Mohd, M., Harun, A. T. And Arif, M. (2009) "Industrialised building system: definition and concept". Paper proceedings in AR COM conference 2009, Nottingham, United Kingdom 7-9 September, 2009

Ahmad, M., Haseneshkorfu, 0. 0., & Nigar, K. (2017). The barriers to the implementation of industrialised building system (IBS) in high rise structure in Selangor. Int J Adv Mech Civ Eng, 4, 94-99.

Chong. W. K., and Low. S. P. (2006). Latent Building Defects: Causes and Design Strategies to Prevent Them. Journal Of Performance Of Constructed Facilities

lsnin et al. (2012). Sustainable Issues in Low Cost Housing Alteration Projects. (36), pp 393-401.

Low, C. M. & Mydin, M. A. 0., 2012. Cement and Concrete Composites. Case studies on construction defects on different types of walling system for building, pp.10354-10357.

Lambers, R., Lamari, F., Skitmore, M., Rajendra, D. (2023) Key residential construction defects: a framework for their identification and correlated causes Construction Innovation. Available at: https://www.scopus.com/inward/record.uri?eid=2-s2.0

N. Ahzahar, N.A. Karim, S.H. Hassan, J. Eman, (2011) 'A Study of Contribution Factors to Building Failures and Defects in Construction Industry, Procedia Engineering,' (20), pp 249- 255.

Othuman, Mydin M.A., Md Sani, N., & Phius, AF. (2014) 'Investigation of Industrialised Building System Performance in Comparison to Conventional Construction Method.' MATEC Web of Conferences. 10, pp. 1-6.

Olanrewaju, A. L. & Abdul-Aziz, AR. (2015). Building Maintenance Processes and Practices. Malaysia: Springer.

Olanrewaju, A., Tan, Y.Y., Soh, S.N. Defect Characterizations in the Malaysian affordable housing (2022) International Journal of Building Pathology and Adaptation, 40 (4), pp. 539- 568.

Rhodes. B. & Smallwood, J. J. 2002. Defect and rework in south African construction project. In: Morledge, R. (ed.). Proceeding of the RICS Foundation Construction and Building Research Conference (COBRA 2002), 5-6 September, Nottingham Trent University, Nottingham. 1-15

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