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A Study on Building Condition Assessment at Kluang High School (STK)

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Abstract

This study emphasizes the value of building condition assessment in preserving the built assets structural integrity, use, and safety. Different building components, such as structural element, mechanical and electrical systems, architectural aspects, and overall performance are all evaluated throughout the evaluation process. This way, the authorities can decide on maintenance, repairs, and renovations to ensure the building has the best possible lifetime and functionality by conducting inspection. This study takes place at Kluang High School (STK), Kluang, Johor. It is quite acceptable for the building to be assessed given that it is now 84 years old. For proactive asset management and extending infrastructure lifespan, effective building condition assessment practices are crucial. The objective of this study is to identify the type of defects that occur on building elements, to evaluate the building condition and to compare the method of building condition assessment which is Condition Survey Protocol (CSP 1) and the Portuguese method. The results of this study show that the buildings are still in good condition even some of the building parts look old. The Condition Survey Protocol (CSP 1) matrix and the Portuguese Method were both employed in this study as the research methods. The data obtained are gathered and compared to determine the best and most reliable approach to be used in building condition assessment process.

1. Introduction

The development of Malaysia towards the year 2020 has positively impacted the expansion of Malaysian industries, particularly industry building. Through investments made by international investors as well as by providing numerous initiatives to the people by enhancing job possibilities and quality of life for the people of a country, the construction sector has a significant influence on the economy of that nation (Shaziman, 2009). All of Malaysia's main cities are experiencing substantial growth in the building sector. Every building that is constructed, however, must deal with the issue of structural flaws or damage to the building's facility service system.

Different strategies are prepared for and put into action during the design and construction phases to address flaws and damage to building components. However, there is still component deterioration that causes finished construction pieces' performance to degrade. As a result, when the building is finished, aspect building maintenance must be done.

Building Condition Assessment (BCA) plays a pivotal role in evaluating the health and performance of structures, ensuring their safety, functionality and longevity. As the built environment

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continues to age and evolve, the need for effective and reliable methods to assess the condition of buildings becomes increasingly critical.

The primary element in guaranteeing the building's usable life is maintenance management. It is essential to make significant efforts to maximize a building's usage, especially when it comes to older structures. According to Hamilton & Ibrahim (2001), buildings require systematic management and ongoing care to prevent deterioration and owner burden. Therefore, maintenance must be carried out according to a plan to assure user comfort and protect an organization's investment in a structure.

To ensure that this study can be completed successfully, several objectives have been established. These include to identify the type of defects that occur on building elements, to evaluate the building condition and to compare the method of building condition assessment which is Condition Survey Protocol (CSP 1) and the Portuguese method.

2. Literature Review

Building condition assessment (BCA) is a process that evaluates a building's physical state, identifying defects, and determining necessary repairs or improvements. It aids building managers, owners, and potential buyers in making informed decisions about maintenance, remodeling, and future investments. Building performance is influenced by a building's physical condition, making it crucial for management to meet maintenance standards [3]. Building elements are the basic components or parts that make up a building's structure, envelope, and interior. These elements are combined to create the overall form, function, and aesthetics of a building. The selection and arrangement of building elements depend on factors such as architectural design, structural requirements, climate conditions, and building regulations [3].

Building damage refers to the deterioration or obsolescence of a building's structure and material fabric over time, influenced by physical properties or external factors like environment and weather. This damage prevents the element from performing as intended and affects the building's fabric, impacting its original function. The Condition Survey Protocol (CSP 1) is a systematic method for assessing a structure's state, based on rating systems. It involves assessing building components and grading problems, with the CSP1 matrix determining the building's score [2]. The Portuguese method, developed by Angelo et al. (2008), ensures evaluations are unaffected by structure type or age, focusing on problem sources rather than repair measures. Techniques are based on existing methods, with expert opinions sought during development and practical implementation [1].

3. Methodology

The data collection process for this study involves identifying objectives, scope, problem statement, and significance. Site visits are conducted to gather relevant information and data, such as a site visit to Kluang High School (STK). Visual inspection is a crucial component of building condition assessment in Malaysia, identifying visible signs of deterioration, damage, or structural issues [5].

The Condition Survey Protocol (CSP 1) is a rating system for building inspections, used to evaluate construction flaws. It uses numerical analysis to grade the condition and severity of damage and defects, assigning a scale. The CSP1 Matrix provides condition and priority assessments, with each numerical score accompanied by a scale value and description [2].

SCALE	PRIORITY ASSESSMENT			
	E4	U3	R2	N1
5	20	15	10	5
4	16	12	8	4
3	12	9	6	3
2	8	6	4	2
1	4	3	2	1

Figure 1: The Matrix

The Portuguese Method is a building condition assessment methodology in Portugal that divides a building into functional components and evaluates each element's flaws. Experts assist in organizing tables, establishing weighting coefficients, and defining general standards. A checklist with eight sections is created for data registration. The level of a defect is assessed by comparing current performance with original performance, not considering quality, safety, or adherence to regulations [1].

This study uses the Condition Survey Protocol (CSP 1) and the Portuguese method to identify building damage and defects. These methods provide a standardized framework for evaluating building condition, ensuring consistency in data collection and reporting. Data comparisons are conducted to determine method objectives, inspection scope, assessed section, criteria, implementation tools, and finding method, providing insight into their suitability, precision, and feasibility. The data are presented in tables to make it easier to see the differences.

4. Result And Discussion

The CSP 1 method is used to analyze all the damage found in the STK administration block. Data was obtained during a visual inspection of the building. The analysis is done using a matrix state measurement form that will state the level of damage based on the recorded pictures. The Portuguese method also used to analyze all the damage found in the STK administration block. Data was obtained during a visual inspection of the building. The level of a defect is assessed by comparing the current performance with the original performance. This does not take account of the original level of quality or safety, adherence to building regulations or the presence of illegal constructions.

Table 1 *Overall Defect Analysis Using CSP 1 Matrix*

		CSP 1			
NO	**DEFECT**	**Condition**	**Priority**	**Matrix**	**Colour**
1	No tiles	**2**	**2**	**4**	
2	Rotten doors	**3**	**3**	**9**	
3	Rotten doors	**3**	**3**	**9**	
4	Cracked floor	**2**	**2**	**4**	
5	Uneven Plaster	**1**	**1**	**1**	
6	Cracked floor	**1**	**1**	**2**	
7	Missing window panel	**3**	**2**	**6**	
8	Mouldy floor	**1**	**1**	**2**	
9	Cracked floor	**3**	**2**	**6**	
10	Cracked floor	**3**	**2**	**6**	
11	Cracked floor	**3**	**2**	**6**	
12	Cracked floor	**3**	**2**	**6**	
13	Cracked floor	**3**	**2**	**6**	
14	Botanical damage	**3**	**2**	**6**	
15	Torn off plaster	**1**	**1**	**2**	
16	Messy wiring	**3**	**2**	**6**	
17	Leakage	**2**	**3**	**6**	
18	Messy wiring	**2**	**2**	**4**	
19	Chipped wall paint	**1**	**1**	**2**	
20	Chipped wall paint	**1**	**1**	**2**	
21	Chipped wall paint	**1**	**1**	**1**	
22	Strain on connecting wall	**4**	**4**	**16**	
23	Chipped wall paint	**1**	**1**	**2**	
24	No tiles	**2**	**2**	**4**	
25	Bad wall finishes	**2**	**2**	**4**	
26	Cracked floor	**2**	**2**	**4**	
27	Chipped wall paint	**1**	**1**	**1**	
28	Chipped wall paint	**2**	**2**	**4**	
29	Cracked floor	**1**	**2**	**2**	
30	Broken tiles	**3**	**3**	**9**	
31	Missing parquet	**3**	**3**	**9**	
32	Chipped wall paint	**1**	**1**	**1**	
33	Rotten wall	**2**	**2**	**4**	
34	Cracked floor	**2**	**2**	**4**	
35	Messy wiring	**3**	**3**	**9**	
36	Messy wiring	**3**	**3**	**9**	
37	Leakage	**2**	**2**	**4**	
38	Chipped wall paint	**1**	**1**	**1**	
39	Broken tiles	**3**	**3**	**9**	

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40	Strain on connecting wall	**3**	**3**	**9**	
41	Chipped wall paint	**1**	**1**	**2**	
42	Missing part of the ceiling	**2**	**2**	**4**	
43	Chipped wall paint	**1**	**1**	**1**	
44	Leakage	**2**	**2**	**4**	
45	Uneven plaster	**2**	**1**	**2**	
46	Broken switch	**5**	**4**	**20**	
47	Broken ceiling	**2**	**2**	**4**	
48	Cracked wall	**2**	**2**	**4**	
49	Burned socket	**5**	**4**	**20**	
50	Mouldy slab	**2**	**2**	**4**	
51	Messy wiring	**3**	**3**	**9**	
52	Leakage	**2**	**2**	**4**	
53	Messy wiring and mould	**3**	**3**	**9**	
54	Leakage	**2**	**2**	**4**	
55	Leakage	**2**	**2**	**4**	
56	Pest infestation	**2**	**2**	**4**	
57	Broken ceiling	**1**	**1**	**2**	
58	Chipped wall plaster	**1**	**1**	**2**	
59	Pest infestation	**2**	**2**	**4**	
60	Leakage	**3**	**2**	**6**	
61	Leakage	**3**	**2**	**6**	
62	Pest infestation	**2**	**2**	**4**	
Total Matrix Score (*a*):			**324**		
Number of Defects (*b*):			**62**		
Total Score *(a/b)*:			**5.23**		
Overall Building Rating:			**Fair**		

Table 2 *Defect Analysis Using Portuguese Method*

Level: First Floor | **Location:** Gallery

Element	**Defects**							
	Minor (5)	**Slight (4)**	**Medium (3)**	**Severe (2)**	**Critical (1)**	**Not Applicable**	**Weight**	**Score**
Wall			/				**3**	**9**
Ceiling			/				**2**	**6**
Window						/	**2**	**-**
Door						/	**2**	**-**
Floor						/	**2**	**-**
Wiring			/				**3**	**9**
Total Score (*a*)								**24**
Total Weight (*b*)								**8**
Defect Index (*a/b*)								**3**
Class of Defect								**Medium**

Table 3 *Comparison of Methods Parameter*

Parameter	Condition Survey Protocol (CSP 1)	Portuguese Method
Objective of Method	- Provide rating & information related to defects.	- Provide rating & information related to defects.
Scope of Method	- Architectural, civil, mechanical, electrical & external work.	- Architectural, civil, mechanical, electrical & external work.
Distress Assessed	- List of defects & simply describe the cause of defects.	- Only list of defects & their components.
Assessment Criteria	- Defects recorded with photo. - Have 5-point color-coded matrix.	- Defected component recorded. - Use defect index & weight.
Implementation Tools	- Checklist & instructions guideline.	- Checklist & instructions guideline.

As shown in the table, both the Condition Survey Protocol (CSP 1) and the Portuguese method offer advantages as well as limitations, according to the analysis. However, both methods can still be applied in the process of assessing the building condition.

5. Conclusion

This study aimed to identify and evaluate the type of defects in building elements at Kluang High School (STK). The identified defects include cracked floors, walls, doors, uneven plaster, cracked tiles, messy wiring, leakage, broken switches, and pest infestation. The study concluded that the administration block at STK has several defects that can affect the building's condition and occupants. Improving maintenance work and quality control of building materials is crucial to enhance the building's condition.

The study also evaluated the building's condition using the Condition Survey Protocol (CSP 1) matrix and the Portuguese method. The CSP 1 matrix showed a fair category for the building, while the Portuguese method showed a good and fair condition. However, urgent maintenance is needed to restore the building's condition and ensure comfort and safety.

The study also compared the CSP 1 matrix and the Portuguese method, focusing on their visual inspection methods. The comparison was based on objective, scope, distress assessed, assessment criteria, implementation tools, and overall building rating. The results of the comparison can help choose a more ideal method for future building condition assessments.

6. Recommendation

The study at Kluang High School (STK) identified several issues and proposed solutions to address building defects. Regular inspections are necessary to repair and prevent future damage. Proper maintenance using appropriate methodologies and strategies is crucial for ensuring flawless restoration.

Early detection can prevent small defects from escalating into more severe damage. Authorities like Jabatan Kerja Raya (JKR) should conduct routine inspections and assess the nature of damage to simplify maintenance and restoration processes. The school should also participate to ensure user comfort and safety. The choice of contractors is crucial for maintaining high-quality work. The study has achieved its objectives, but improvements can be made to increase its effectiveness. These include expanding the scope of study, involving other building structures, and selecting more methods for comparing building condition assessment methods.

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Conflict of Interest

The authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The author alone is accountable for the following: creating and planning the study, gathering and analysing the data, concluding the findings, and writing the manuscript.

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