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A Preliminary Building Assessment of The Structural Defect on Selected Klinik Kesihatan in Johor

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Abstract: A building condition assessment is the process of examining the entire structure and infrastructure, including mechanical and electrical systems equipment, building frames, internal structure and finishes, and building sites. According to the company Perkhidmatan Sokongan Klinik (PSK) there is lot of complaints filled by the building users that there is lot of defects detected on the building of Klinik Kesihatan in Johor. Visual inspection was carried out to evaluate the building's health and performance in order to determine whether or not it can safely be occupied for another decade. The objectives of this study to identify the types of structural defects on the building and to assess the defect of the structural building on eight selected Klinik Kesihatan in Johor. A qualitative observation was conducted by doing preliminary inspection with visual inspection over the building of Klinik Kesihatan in Johor. The method such as Planned Preventive Maintenance (PPM) checklist, Building Condition Assessment (BCA) also tools of Condition Survey Protocol (CSP) 1 Matrix were used to assess buildings in good condition. A few common minor defects can be found mostly due to cracks at the apron. Analysis has been done and findings overall building rated in fair and good building condition. A conclusion was made by achieved all objectives which is different buildings or structures generate different types of defects and necessitate various levels and types of quality, which are dependent on the building functions, construction or maintenance systems, and materials used. However, further study is required to explore more in repair techniques and selection of materials in the maintenance of selected Klinik Kesihatan in Johor.

Keywords: Visual Inspection, Planned Preventive Maintenance (PPM), Building Condition Assessment (BCA), Condition Survey Protocol (CSP) 1 Matrix

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1. Introduction

A construction flaw occurs when a structure fails to satisfy the demands of its residents. It may also be characterised as a decline, degradation, or failure in the functional performance of the structure. Structure inspections were required to guarantee that the building was safe and that the residents did not feel endangered by the structural condition of the building. So, for preliminary inspection, a visual examination is the ideal approach since it is a simple, non-destructive tool for detecting the status of a building or structure. It is critical for swiftly detecting constructive challenges and deciding the best line of action for problem solving [1]. The goal of building inspections is to assess the technique of repair or conservation of the structure, identify the level of user safety, and aid in the maintenance of the building's function. The most essential purpose of building inspections is to extend the life of the building while retaining the value of building quality.

Facility management services was important to support and add value to a building's main business, including healthcare buildings like Klinik Kesihatan. Cleaning services, linen and laundry services, facility engineering maintenance services, biomedical engineering services, and clinical waste management are among the tasks of the Klinik Kesihatan building's facilities management contractor [2]. A defective structure can no longer provide the functional, aesthetic, or economic values for which it was intended and constructed. Defects have an influence on the building's or its combination's serviceability, performance, acceptability, or aesthetic. A building defect can also be a physical defect in the building, such as a defect in the fabric, structure, or services, especially one that prevents appropriate function. It is also a performance issue that can occur at any time during the element's or building's lifespan [3].

There are two sorts of building defects with is structural problems and non-structural defects. However, the focus of this study is only on building construction flaws. Structural faults are flaws in the structure of a building, such as columns, beams, walls, floors, and foundations. This type of fault is caused by building settlement, deformation, severe cracking, and bending [4]. Cracking, moisture, and unstable foundations are structural issues discovered during the preliminary examination at Klinik Kesihatan. Monitoring and manual inspection are helpful for increasing building safety. To guarantee that a building is always safe to inhabit and in excellent shape, it is necessary to inspect it on a regular basis in order to determine the kind of building problem that develops and then conduct out follow-up work to cure the defect and maintain the structure.

The objectives of this study are:

i. To identify the types of structural defects on the building.

ii. To analyze the defect of the structural building.

This study focuses on the types of structural faults on buildings in order to analyse the structure of building problems in Klinik Kesihatan region Negeri Johor. This study will be conducted at 8 of Klinik Kesihatan in Negeri Johor which is:

i. Klinik Kesihatan Labis

i. Klinik Kesihatan Bandar IOI Segamat

ii. Klinik Kesihatan Bakri

iii. Klinik Kesihatan Bandar Maharani

iv. Klinik Kesihatan Jalan Mengkibol, Kluang

v. Klinik Kesihatan Simpang Renggam

vi. Klinik Kesihatan Pontian

vii. Klinik Kesihatan Taman Universiti Skudai

Figure 1: One of the Klinik Kesihatan for preliminary inspection

The problem of building defects will create a dangerous scenario. As a result, we must guarantee that the building is safe and that its lifespan is extended, which is the primary focus of the building defect investigation. This study was conducted at chosen Klinik Kesihatan locations in Negeri Johor because the safety of the building for the Klinik Kesihatan is extremely significant since it is constantly visited by patients and is where patients receive treatment. As a result, the Klinik Kesihatan's building's comfort and safety are critical.

2. Materials and Methods

Observations conducted in the location of Klinik Kesihatan in Negeri Johor have been photographed and touched defect area as proof of research observations. The flowchart technique is presented in Figure 2.

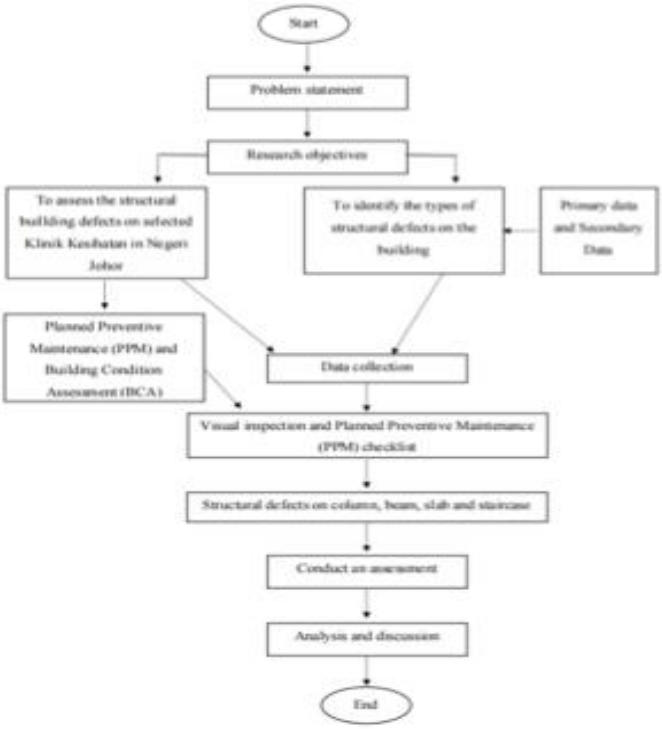

Figure 2: Methodology flowchart

2.1 Tools of Condition Survey Protocol (CSP) Matrix 1

It is used to evaluate assessment building inspection of the structural defects on selected Klinik Kesihatan in Negeri Johor is using Condition Survey Protocol 1 Matrix.

The goals behind the CSP 1 Matrx are:

i. To allow surveyors to gather data in the smallest amount of time feasible by eliminating detailed, longhand write-ups during field operations.
ii. To record the building's existing flaws, the primary source of data, by rating the state and giving a priority to each defect documented.
iii. To determine the general condition of the structure.
iv. To do statistical analysis on the numerical ratings obtained from the survey work.

Tables 1 and 2 provide condition and priority assessments for the CSP1 Matrix. Each score has a scale and explanation. This helps surveyors determine the scale's true condition and rate construction concerns.

Table 1: Condition assessment protocol 1(N. Hamzah., et al., 2010) [6]

Condition	Scale value	Description
1	Good	Minor servicing
2	Fair	Minor repair
3	Poor	Minor repair/replacement
4	Very poor	Malfunction
5	Dilapidated	Damage/replacement of missing part

Table 2: Priority assessment (N. Hamzah., et al., 2010)

Priority	Scale value	Description
1	Normal	Functional; cosmetic defect only
2	Routine	Minor defect, but could become serious if left unattended
3	Urgent	Serious defect, does not function at an acceptable standard
4	Emergency	Element/structure does not function at all or presents risks that could lead to fatality or injury

Each defect has a condition and priority. The sum of each defect's ratings determines its overall score. The matrix matches the total score. 1-20 scale. As shown in Table 3, each of the three factors (Planned Maintenance (1 to 4), Condition Monitoring (5 to 12), and Serious Attention) is assigned a colour (green, yellow, or red) (13 to 20).

Table 3: The Matrix (N. Hamzah., et al., 2010)

Scale	Priority assessment			
	E4	**U3**	**R2**	**N1**

	5	20	15	10	5
Condition	4	16	12	8	4
assessment	3	12	9	6	3
	2	8	6	4	2
	1	4	3	2	1

This technique makes it easy to assess building inspection issues. Red coded defects should be rectified first since they affect the overall building rating and highlight issues that pose a high risk to the structure. This helps the surveyor determine the hazard of issues and provide accurate fault reports.

Table 4: The descriptive value according to score (N. Hamzah., et al., 2010)

No	Matrix	Score
1	Planned maintenance	1 to 4
2	Condition monitoring	5 to 12
3	Serious attention	13 to 20

After assessing each defect, combine the scores and divide by the total number of defects to get the overall building condition. Using the score, the building is rated Good, Fair, or Dilapidated (out of 20).

Table 5: Overall building rating (N. Hamzah., et al., 2010)

No	Building rating	Score
1	Good	1 to 4
2	Fair	5 to 12
3	Dilapidated	13 to 20

3. Results and Discussion

Inspection is the initial step in building upkeep. Inspection of a building needs both the capacity to see problems and a working understanding of the reporting procedures. It usually requires on-site labour and the creation of reports. As a result, an overall evaluation of the structure's state is produced as a result of this research activity. The defect can be found in most of the first floor and in a few select locations on the second floor, as can be seen in the table below, which includes all the tagged locations.

Table 6: Condition Assessment and Rating of a Building using Condition Survey Protocol (CSP) 1 Matrix

Defect plan tag	Building component	Type of defect	Condition rating	Priority	Defect score
F1	Slab/platform	The walkways were separated with the building structure due to soil settlement.	4	3	12
F2	Slab/platform	The brick layer was soil deposition occurs on walkways.	4	3	12
F3	Slab/platform	Due to the constantly moist surface, then cracking occurs because water seeps into the cement surface.	3	2	6
F4	Slab/platform	Broken and crack on apron due to some settlement.	3	2	6

F5	Slab/platform	Gap and crack on some part of apron.	3	2	6
F6	Slab/platform	Broken and crack on apron due to some settlement.	3	2	6
F7	Beam	Clip gutter is broken and the rail was fell because there was no support.	3	2	6
F8	Slab/platform	Concrete scaling/spalling surface has cracked.	4	2	8
F9	Slab/platform	No tiles on the platform.	4	2	8
F10	Slab/platform	Broken and crack on apron due to some settlement.	4	2	8
F11	Slab/platform	Gap and crack on some part of apron.	4	2	8
F12	Column	Cracking of plastering between wall and column.	4	3	12
F13	Column	Cracking of plastering between wall and column.	4	3	12
F14	Slab/platform	Crack on some part of apron.	3	2	6
F15	Slab/platform	Insufficient width of apron.	3	2	6
F16	Slab/platform	Crack on some part of apron.	3	2	6
F17	Slab/platform	Roof leaking.	3	2	6
F18	Column	Water seepage.	3	2	6
F19	Slab/platform	Broken and crack on apron due to some settlement.	3	2	6
F20	Slab/platform	Roof leaking.	4	3	12
F21	Column	Crack between column and wall occur due to unpresent of lintol on the top frame of the window.	4	3	12
F22	Column	The shear crack occurs due to the movement of soil at the main road.	4	3	12
F23	Staircase	Might be bar corrosion due to no minimum concrete cover.	2	1	2
F24	Column	The shear crack occurs due to the movement of soil at the main road.	4	3	12
F25	Column	The shear crack occurs due to the movement of soil at the main road.	4	3	12
F26	Column	The shear crack occurs due to the movement of soil at the main road.	4	3	12
F27	Slab/platform	The walkways were separated with the building structure due to soil settlement.	3	2	6

According to the data in the table, the descriptive value corresponds to the scores 1–4which is scheduled monitoring and 5–12 in the matrix for condition monitoring. This may be deduced. Overall, the building's condition is classified as fair and good, with a score of 1 to 4 and 5 to 12 respectively.

3.1 The summary data of the building defects at Klinik Kesihatan in Johor

The defect types in all locations including columns, beams, stairs, and slabs/platforms are summarised in Table 7.

Table 7: Summarize of defect types in all locations

No.	Types of defect (nos) **Klinik Kesihatan in Johor**	Column	Beam	Staircase	Slab/platform
1.	Klinik Kesihatan Jalan Mengkibol, Kluang	0	0	0	5
2.	Klinik Kesihatan Simpang Renggam	0	0	0	2
3.	Klinik Kesihatan Pontian	0	1	0	3
4.	Klinik Kesihatan Taman Universiti Skudai	2	0	0	0
5.	Klinik Kesihatan Bakri	0	0	0	2
6.	Klinik Kesihatan Bandar IOI Segamat	0	0	0	2
7.	Klinik Kesihatan Labis	1	0	0	2
8.	Klinik Kesihatan Bandar Maharni	5	0	1	1

According to the summary, the slab/platform has the most defects, followed by the column. Then, the staircase and beam contain the fewest defects. In the case of slab/platform, the presence of cracks in every concrete slab is the cause. Even in slabs that are not visible, microcracks caused by common shrinkage can be observed. During the curing phase of fresh concrete, contraction is inevitable. In open air, concrete tends to contract as it hardens. A portion of the water in the concrete evaporates, causing the material to contract. Cracking occurs when shrinkage forces exceed the strength of the concrete. Consequently, concrete cracks are inevitable and rarely cause for concern [7] (Mindess, S., 2019).

Other than compression and buckling, fore column defects are caused by compression and buckling. In a compression test, it is the material itself, not the column, that fails. When the axially loaded stress exceeds the allowable stress, a shorter and wider column will fail by compression failure when the axially loaded stress exceeds the allowable stress. When concrete begins to fail or bulge as a result of compression, this is known as compression failure. This is due to the concrete and steel composition of the column. The compressive strength of a material indicates how much weight it can support before failing. The compressive strength of various materials varies greatly. When columns are shifted laterally or horizontally, the structure buckles and collapses. Failure to analyse the structural members to

determine whether failures were due to the concrete used in the design or another factor [8] (Li, Q., et al., 2018).

During a preliminary inspection of the staircase, the researcher discovered a minor defect, bar corrosion. After embedding steel reinforcement into the formwork, concrete is poured to create a reinforced concrete structure (shuttering). Using embedded steel reinforcements will increase the tensile and bending strength of the concrete frame. Various factors cause the embedded steel to corrode with time. The primary cause of the problem is a lack of concrete covering for the steel. In addition to carbonation, electrolysis, and alkali-aggregate reactions, carbonation, electrolysis, and alkali-aggregate reactions can cause corrosion of reinforcing steel in concrete [9] (Goyal, A., et al., 2018).

In addition, beam defects caused by excessive design loads can occur in any of three directions: flexure, torsion, and shear. Depending on the type of load applied to the beam and the factored load, structural failure may occur. In addition, different types of loads can cause deflections. In addition to point loads, uniformly distributed loads, and wind loads, the most common types of loads include shear, ground pressure, and earthquakes. Failure of a component can occur if a load causes excessive deflection [10] (Abedini, M., et al., 2020).

As a conclusion, it can be stated that there are numerous structural defect possibilities. Even if it only appears as a small crack at first, long-term defects can cause the collapse of the entire wall. Unsuitable soils used as building materials, sloppy construction techniques, and insufficient damp-proofing are the primary causes of dampness. When using soil as a building material throughout construction, it is necessary to adhere to best practises and all applicable building codes and regulations. Due to structural defects, the earthen wall is no longer stress-resistant after structural cracking.

4. Discussion

The columns, beams, slabs, and staircases all had to be examined over the process of the building's examination. According to the results of the four-element investigation, the following are the findings:

a) The quality of each column's components is satisfactory. The columns of the structure were found to be extremely durable.

b) Each and every one of the beam's constituent parts is operating at an appropriate level. On the building's girders, no structural flaws were discovered.

c) Due to homogeneous ground settlement, there are few small cracks on the apron.

d) The quality of the stair components is satisfactory. The building's stairwells were confirmed to be structurally sound.

5. Conclusion

A study evaluated defects at Klinik Kesihatan in Johor. This probe seeks building flaws. Different building functions, systems, and materials cause different types of defects and require different quality levels. Major or minor defects. A major defect renders a building unsafe, unfit for habitation, or unusable. Poor workmanship or deficient materials don't make a building unsafe, unfit for living in, or unfit for its intended use. This investigation found cracks, mostly on the apron. The Condition Survey Protocol (CSP) 1 Matrix was chosen after studying current methods. It rates construction defects. This method gathers data quickly by eliminating descriptions, prioritises defects based on recommendations, and evaluates the whole building. The study measures decent building conditions. The researchers hope this study will help identify defects in a Johor clinic to prevent damage. Before being used for large property inspections, CSP1 Matrix needs more testing. The CSP1 Matrix is probably unsuitable for preparing a Building Survey report.

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