

Building Construction Defects at Noakhali Sadar Upazila in Bangladesh

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Abstract:- Defects in construction can compromise the safety of a building's occupants. Construction defects can also lead to legal disputes between property owner's contractors, architects and other parties involved in the construction process. Resolving these disputes can be time consuming and costly. The first step to solve the building construction defects is to conduct a thorough inspection of the building to identify all existing defects. Determine the root cause of each defect. This may involve investigating construction practices, material quality, design flaws, Environmental Factors and other contributing factors. Understanding the underlying cause is essential for developing effective solution and preventing recurrence. In this paper we used manual survey of 20 buildings from selected area to collect data. To depicts the true scenario of building defects we selected seven different parameter named crack; rising dampness; peeling paint; fungi attack; moisture in air; spalling of concrete tilting; Efflorescence and Seepage. After Analyzing the data, we found that the highest percentage of defect was peeling paint around 20.33% of the building, While the effect of efflorescent was the lowest point of about 5.69%. In conclusion, from the result it is clear that construction defects in Bangladesh is a significant problem. It is important to carry out the necessary repairs, replacements or modifications according to the remediation plan. This may involve coordinating with contractors, suppliers and other relevant parties to ensure that the work is completed correctly and effectively.

Keywords:- Construction, Faults, Retrofit, Tilting, Efflorescence, Settlement.

I. INTRODUCTION

Structural integrity and safety are directly related to sustainable building performance during its service life. In recent years, serious concerns have been raised about the risks associated with building defects and failures. Building failure is a by-product of defective work, defects, or deviations from specified quality of work. due to structural

failure, many buildings collapsed and many people were killed as a result.

Thus, to ensure the structural safety and durability of buildings, building professionals and related stakeholders need to understand the potential and complex causes, types and drivers of building failure. Although a serious concern to study building defects is observed in other parts of the world (Bortolini and Forcada 2018, Johnson and Gunnellin 2019)

Bangladesh, a densely populated and high-growth country, is neglected in such studies. In response, therefore, this research aims to identify potential and complex causes of building failures and their drivers. This conclusion is reached through a literature review and a critical analysis of some detailed building assessment reports collected from Maizde, Sadar Upazila, Noakhali Bangladesh.

II. METHODOLOGY

A. Study Area

The study Area is Maijdee, Sadar upazila, Noakhali.

B. Description of Study Area

Noakhali is a district in the Chittagong Division of Bangladesh. It is located on the coast of the Bay of Bengal, and is bordered by the Meghna River to the north, the Feni River to the south, and the Bay of Bengal to the east. The district is a major agricultural area, and is also home to a number of industries, including textiles, fishing, and shipbuilding.

Construction is a major industry in Noakhali. The district is home to a number of construction companies, which specialize in a variety of projects, including residential, commercial, and industrial construction. The construction industry in Noakhali is growing rapidly, due to a number of factors, including the increasing population, the growing economy, and the government's focus on infrastructure development.

➤ Residential Construction

Residential construction is the largest segment of the construction industry in Noakhali. The district is home to a growing population, which is driving the demand for new housing. The construction of new houses is also being supported by the government's housing program, which provides loans and subsidies to low-income families.

➤ Commercial Construction

Commercial construction is another major segment of the construction industry in Noakhali. The district is home to a number of businesses, which are expanding and requiring new space. Commercial construction projects include office buildings, shopping malls, hotels, and restaurants.

➤ Industrial Construction

Industrial construction is also growing in Noakhali. The district is home to a number of industries, which are expanding and requiring new facilities. Industrial construction projects include factories, warehouses, and power plants.

➤ Infrastructure Development

The government is investing heavily in infrastructure development in Noakhali. This includes the construction of new roads, bridges, and water treatment plants. Infrastructure development is creating new opportunities for the construction industry.

C. Procedure of the Experiment

This study reviewed previous literature related to building defects and assessed 15 building assessment reports collected from three prominent civil engineering firms in Noakhali. The reports were investigated thoroughly, and different types of defects affecting different components of the buildings, possible causes of the defects, and the responsible authorities behind each occurrence of the causes of the defects were retrieved for each report. After that, the buildings' characteristics were analyzed, the defect types of each building, their corresponding building components, possible causes of the defects, and the responsible actors were tabulated. These factors were then ranked based on the number of defects to determine the most common defect types, defective building components, the possible causes of defects, and the main responsible actors causing defects. Based on the analysis, necessary recommendations were proposed for reducing the likelihood of defects occurring in future building construction projects.

D. Building Characteristics

Out of the twenty buildings, eleven are used for residential purposes; six are used for a mixed purpose, i.e., commercial and residential. There are also three college buildings involved in this study. The college buildings have public ownership, while private individuals own the rest of the buildings. The buildings' age varies with a wide range of times, e.g., all of the buildings were constructed from 2005 to 2022. The size (area per floor) of the buildings also differs vastly, starting from 1800 sft (building) to 12000 sft (building). Five buildings are six stories, four buildings are

ten stories, seven buildings are eight stories, and a few others are four and five stories. Overall, the buildings' various characteristics ensure their diversity, which can help grasp a comprehensive structural or non-structural failure scenario of the building construction industry in the focused territory of Bangladesh.

E. Basic Categories of Construction Defects

Crack: In civil engineering, cracking is a common issue that can occur in a variety of constructions, including roads, bridges, buildings, and dams. Numerous things, such as structural overload, subpar building techniques, foundation settlement, thermal expansion and contraction, moisture and water damage, and chemical reactions, can cause these fractures. The discovered fracture types vary in severity, ranging from modest shrinkage or settlement-related hairline cracks to more severe vertical, diagonal, or horizontal cracks that may indicate structural movement, differential settlement, or excessive pressure. In order to maintain the structural integrity and functionality of civil engineering projects and ensure their long-term durability and safety, it is imperative to identify the cause and kind of cracks and adopt efficient repair and preventative techniques.



Fig 1 Crack between bay Windows Corners

➤ Rising Dampness:

In civil engineering, rising moisture is a major concern, especially for buildings and structures made of porous materials like concrete or masonry. This process happens when soil moisture or groundwater is pushed upward into the building materials through capillary action, causing dampness and structural deterioration over time. Inadequate damp-proofing techniques, excessive groundwater levels, or subpar drainage systems are common culprits. Growing dampness can cause unattractive stains, paint and plaster damage, structural deterioration, and the growth of mold and mildew, all of which can be dangerous to one's health and undermine the structural integrity of the structure. A comprehensive strategy is needed to address rising dampness, including appropriate waterproofing methods, efficient drainage systems, and corrective actions such as adding damp-proof membranes or utilizing materials resistant to moisture.



Fig 2 Rising Dampness Problem

➤ *Peeling Paint:*

Peeling typically affects the facades of buildings, primarily on the plastered walls, columns, and other places that are subjected to a lot of moisture and rain (Figure 4). When peeling paint starts to show on the outside walls of some structures that are close to the water, the danger level may increase significantly.

Poor surface preparation is always the cause of peeling paint. Most peeling paint issues arise on surfaces that are exposed to sunlight, rain, and temperature fluctuations. An ugly mess might result from involved walls of a house or structure. The homeowner might feel embarrassed and frustrated as a result. When paint begins to peel from an interior wall, it is typically the result of an incorrect surface preparation prior to painting. In addition, the moisture that surrounds the wall penetrates through to the paint surface. Therefore, repainting the wall with peeling paint can be done to repair and restore it and make it look nice again. Peeling paint, according to Midway Industrial Supply, is just another form of flaking in which there is a higher removal of paint film. The lifting of small to large parts of paint is known as flaking and is caused by the paint's brittleness and poor adherence.



Fig 3 Peeling Paint

➤ *Fungi and Small Plant Attack:*

Throughout the year, mold and fungi can be found both indoors and outdoors (Figure 9). Although mold is sometimes confused with fungi, fungi are actually a form of mold. Concerns regarding mold exposure inside have grown as more people become aware of the negative health impacts that mold exposure can have. There are thousands of different types of mold, and the majority, if not all, of the mold that is discovered indoors originates outdoors. It appears that it will only proliferate and become a greater problem in the presence of wetness, excessive humidity, or water damage.

Specific rules for the building industry, shipyard work, and general industry address mold. Molds reside on dead things, in the soil, and on plants, as well as on decaying or dead materials. Molds are essential to the decomposition of leaves, wood, and other plant detritus outside. As members of the fungal kingdom, molds are dependent on the digestion of plant materials and other organic compounds for sustenance, as they lack chlorophyll, unlike plants. Our environment would be overrun with a lot of dead plant materials if mold didn't exist.



Fig 4 Fungi and Small Plant Attack

➤ *Tilting:*

Tilting is a concerning issue encountered in civil engineering construction, often leading to structural instability and potential hazards. This problem arises when a structure deviates from its intended vertical alignment, resulting in a leaning or tilting effect. Several factors can contribute to tilting, including uneven settlement of the foundation, soil erosion, inadequate soil compaction, or structural defects. As the structure tilts, it may compromise its load-bearing capacity, leading to structural failure or collapse if left unaddressed. Timely detection and intervention are crucial to mitigate the risks associated with tilting. Engineers employ various techniques such as soil stabilization, underpinning, or structural reinforcement to rectify the tilt and ensure the structural integrity of the construction. Regular monitoring and maintenance are essential to prevent tilting issues from escalating and to uphold the safety and stability of civil engineering projects.

➤ *Efflorescence:*

A frequent problem in civil engineering projects is efflorescence, especially in those made of masonry components like bricks, concrete blocks, or natural stone. This process happens when moisture dissolves soluble salts, which are usually found in the surrounding soil or building materials, and causes capillary action to carry the dissolved salts to the surface. The salts are left behind after the moisture evaporates, leaving behind a white, powdery residue on the structure's surface. Efflorescence is not just an eyesore on the building but also a sign of deeper problems like leaky roofs, improper drainage, or insufficient waterproofing. Furthermore, it may eventually lead to degradation, spalling, or cracking, which could impair the materials' structural integrity. Adequate ventilation, surface treatments, and appropriate waterproofing are examples of preventive actions that can assist in reducing efflorescence problems. In addition, in order to stop moisture intrusion

from happening again and guarantee the long-term resilience of civil engineering structures, it is crucial to locate and solve its underlying cause.

III. RESULTS AND DISCUSSION

The common defects were crack, settlement, tilting, seepage, and efflorescence. Maximum defects occurred in the column, the major structural component, followed by slab and foundation. The causes of the defects were no structural design, improper design, no/improper sub-soil investigation, poor workmanship, poor quality of the used materials, and change of building loads. Among others, poor workmanship was producing the highest defects afterward, no or improper soil investigation. The contractors produced the highest number of defects, while owners and contractors produced more than 85% defects.

Table 1 Defect Type, Building Name, Defected Component

| No | Defect type | Building Name/ Address | Defected Components | | | | Possible Causes | | | Storied No |
|--------------|----------------------|---------------------------|---------------------|----------|----------|----------|------------------|-------------------|------------------|------------|
| | | | Column | Beam | Slab | Wall | Poor Workmanship | Defects Materials | Natural Disaster | |
| 01 | Crack | Jahid bhila | √ | √ | | √ | | | | 05 |
| | Rising Dampness | Rashid colony, | | | | √ | | | √ | |
| | Peeling paint | House no-01, | | √ | | √ | | | √ | |
| | Fungi attack | Road no-02, | | | | √ | | | √ | |
| | Moisture in the air | Maijde Sadar, | | | √ | | | | √ | |
| | Spalling of concrete | Noakhali | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| | Seepage | | | | | √ | | | | |
| Total | | | 3 | 2 | 1 | 7 | 0 | 1 | 4 | |
| 02 | Crack | Lotif monjil | √ | √ | | √ | | | | 07 |
| | Rising Dampness | College road, | | | | √ | | | √ | |
| | Peeling paint | House no-09, | √ | √ | | √ | | | √ | |
| | Fungi attack | Road no-04, | | | | √ | | | | |
| | Moisture in the air | Maijde Sadar, | | | √ | | | | √ | |
| | Spalling of concrete | Noakhali | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| | Seepage | | | | | √ | | | | |
| Total | | | 4 | 2 | 1 | 7 | 0 | 1 | 3 | |
| 03 | Crack | Fatima Manjil | √ | | √ | √ | | | | 10 |
| | Rising Dampness | Rashid coloni, | | | | √ | | | | |
| | Peeling paint | House no-10, | √ | √ | | √ | | | √ | |
| | Fungi attack | Road no-03, | | | | √ | | | | |
| | Moisture in the air | Maijde Sadar, | | | √ | | | | √ | |
| | Spalling of concrete | Noakhali | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| | Seepage | | | | √ | √ | | | | |
| Total | | | 4 | 1 | 3 | 7 | 0 | 1 | 2 | |
| 04 | Crack | Rahat kutir | √ | √ | | √ | | | | 07 |
| | Rising Dampness | Hospital road, | | | | √ | | √ | √ | |
| | Peeling paint | Houseno-6, | | √ | | √ | | | √ | |
| | Fungi attack | Road no-02, | | | | √ | | | √ | |
| | Moisture in the air | Maijde Sadar, | | | √ | | | | √ | |
| | Spalling of concrete | Noakhali | √ | | | | | √ | | |
| Tilting | | √ | | | √ | | | | | |

| No | Defect type | Building Name/ Address | Defected Components | | | | Possible Causes | | | Storied No |
|--------------|----------------------|---------------------------|---------------------|----------|----------|----------|------------------|-------------------|------------------|------------|
| | | | Column | Beam | Slab | Wall | Poor Workmanship | Defects Materials | Natural Disaster | |
| | Efflorescence | | | | | √ | | | | |
| | Seepage | | | | | √ | | | | |
| Total | | | 3 | 2 | 1 | 7 | 0 | 2 | 4 | |
| 05 | Crack | Rokeya Manjil | √ | √ | | √ | | | | 06 |
| | Rising Dampness | Rashid coloni,, | | | | √ | | | √ | |
| | Peeling paint | House no-19, | √ | √ | | √ | | | √ | |
| | Fungi attack | Road no-06, | | | | √ | | | | |
| | Moisture in the air | Maijde Sadar, | | | √ | | | | √ | |
| | Spalling of concrete | Noakhali | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| Seepage | | | | | √ | | | | | |
| Total | | | 4 | 2 | 1 | 7 | 0 | 1 | 3 | |
| 06 | Crack | Shahin tower | √ | | √ | √ | | | | 04 |
| | Rising Dampness | Kazi coloni, | | | | √ | | | | |
| | Peeling paint | House no-16, | √ | √ | | √ | | | √ | |
| | Fungi attack | Road no-05, | | | | √ | | | | |
| | Moisture in the air | Maijde Sadar, | | | √ | | | | √ | |
| | Spalling of concrete | Noakhali | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| Seepage | | | | √ | √ | | | | | |
| Total | | | 4 | 1 | 3 | 7 | 0 | 1 | 2 | |
| 07 | Crack | Rahman mansions | √ | √ | | √ | | | | 05 |
| | Rising Dampness | College road, | | | | √ | | √ | √ | |
| | Peeling paint | House no-13, | | √ | | √ | | | √ | |
| | Fungi attack | Road no-02, | | | | √ | | | √ | |
| | Moisture in the air | Maijde Sadar, | | | √ | | | | √ | |
| | Spalling of concrete | Noakhali | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| Seepage | | | | | √ | | | | | |
| Total | | | 3 | 2 | 1 | 7 | 0 | 2 | 4 | |
| 08 | Crack | Mijan mansions | √ | √ | | √ | | | | 07 |
| | Rising Dampness | Mosjid road, | | | | √ | | | √ | |
| | Peeling paint | House no-07, | √ | √ | | √ | | | √ | |
| | Fungi attack | Road no-05, | | | | √ | | | √ | |
| | Moisture in the air | Maijde Sadar, | | | √ | | | | √ | |
| | Spalling of concrete | Noakhali | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| Seepage | | | | | √ | | | | | |
| Total | | | 4 | 2 | 1 | 7 | 0 | 1 | 3 | |
| 09 | Crack | Noakhali govt. college | √ | | √ | √ | | | | 04 |
| | Rising Dampness | Maijdi cort, | | | | √ | | | √ | |
| | Peeling paint | Maijdi, sadar | √ | √ | | √ | | | √ | |
| | Fungi attack | | | | | √ | | | √ | |
| | Moisture in the air | | | | √ | | | | √ | |
| | Spalling of concrete | | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| Seepage | | | | √ | √ | | | | | |
| Total | | | 4 | 1 | 3 | 7 | 0 | 1 | 2 | |
| 10 | Crack | Faisal village | √ | √ | | √ | | | | |
| | Rising Dampness | Hospital road, | | | | √ | | | √ | |
| | Peeling paint | House no-21, | | √ | | √ | | | √ | |

| No | Defect type | Building Name/ Address | Defected Components | | | | Possible Causes | | | Storied No |
|--------------|----------------------|---|---------------------|----------|----------|----------|------------------|-------------------|------------------|------------|
| | | | Column | Beam | Slab | Wall | Poor Workmanship | Defects Materials | Natural Disaster | |
| | Fungi attack | Road no-07, Maijde Sadar, Noakhali | | | | √ | | | √ | 05 |
| | Moisture in the air | | | | √ | | | | √ | |
| | Spalling of concrete | | √ | | | | √ | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| | Seepage | | | | | √ | | | | |
| Total | | | 3 | 2 | 1 | 7 | 1 | 1 | 4 | |
| 11 | Crack | Hasib cotege Maijdi bazar road, House no-06, Road no-03, Maijde Sadar, Noakhali | √ | √ | | √ | | | | 07 |
| | Rising Dampness | | | | | √ | | √ | | |
| | Peeling paint | | √ | √ | | √ | | | √ | |
| | Fungi attack | | | | | √ | | | | |
| | Moisture in the air | | | | √ | | | | √ | |
| | Spalling of concrete | | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| Seepage | | | | √ | | | | | | |
| Total | | | 4 | 2 | 1 | 7 | 0 | 1 | 3 | |
| 12 | Crack | Fahad Manjil kaji coloni., House no-14, Road no-04, Maijde Sadar, Noakhali | √ | | √ | √ | | | | 10 |
| | Rising Dampness | | | | | √ | | | | |
| | Peeling paint | | √ | √ | | √ | | | √ | |
| | Fungi attack | | | | | √ | | | | |
| | Moisture in the air | | | | √ | | | | √ | |
| | Spalling of concrete | | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| Seepage | | | √ | √ | | | | | | |
| Total | | | 4 | 1 | 3 | 7 | 0 | 1 | 2 | |
| 13 | Crack | Nila cotage Rashid coloni., House no-01, Road no-02, Maijde Sadar, Noakhali | √ | √ | | √ | | | | 06 |
| | Rising Dampness | | | | | √ | | √ | | |
| | Peeling paint | | | √ | | √ | √ | | √ | |
| | Fungi attack | | | | | √ | | | √ | |
| | Moisture in the air | | | | √ | | | | √ | |
| | Spalling of concrete | | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| Seepage | | | | √ | | | | | | |
| Total | | | 3 | 2 | 1 | 7 | 1 | 1 | 4 | |
| 14 | Crack | Lake viwe Nabagram road, House no-23, Road no-09, Maijde Sadar, Noakhali | √ | √ | | √ | | | | 08 |
| | Rising Dampness | | | | | √ | | √ | | |
| | Peeling paint | | √ | √ | | √ | | | √ | |
| | Fungi attack | | | | | √ | | | | |
| | Moisture in the air | | | | √ | | | | √ | |
| | Spalling of concrete | | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| Seepage | | | | √ | | | | | | |
| Total | | | 4 | 2 | 1 | 7 | 0 | 1 | 3 | |
| 15 | Crack | Majeda Village Nabagram road, House no-45, Road no-08, Maijde Sadar, | √ | | √ | √ | | | | 10 |
| | Rising Dampness | | | | | √ | | | | |
| | Peeling paint | | √ | √ | | √ | √ | | √ | |
| | Fungi attack | | | | | √ | | | | |
| | Moisture in the air | | | | √ | | | | √ | |
| | Spalling of concrete | | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| Seepage | | | √ | √ | | | | | | |

| No | Defect type | Building Name/ Address | Defected Components | | | | Possible Causes | | | Storied No |
|--------------|----------------------|--|---------------------|----------|----------|----------|------------------|-------------------|------------------|------------|
| | | | Column | Beam | Slab | Wall | Poor Workmanship | Defects Materials | Natural Disaster | |
| | | Noakhali | | | | | | | | |
| Total | | | 4 | 1 | 3 | 7 | 1 | 1 | 2 | |
| 16 | Crack | Mijan house Housing, Road no-04, house no-011, Maijde Sadar, Noakhali | √ | √ | | √ | | | | 05 |
| | Rising Dampness | | | | | √ | | √ | | |
| | Peeling paint | | | √ | | √ | | √ | | |
| | Fungi attack | | | | | √ | | √ | | |
| | Moisture in the air | | | | √ | | | √ | | |
| | Spalling of concrete | | √ | | | | √ | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| | Seepage | | | | | √ | | | | |
| Total | | | 3 | 2 | 1 | 7 | 1 | 2 | 4 | |
| 17 | Crack | Sajeda garden housing, House no-06, Road no-03, Maijde Sadar, Noakhali | √ | √ | | √ | | | | 08 |
| | Rising Dampness | | | | | √ | | √ | | |
| | Peeling paint | | √ | √ | √ | √ | | √ | | |
| | Fungi attack | | | | | √ | | √ | | |
| | Moisture in the air | | | | √ | | | √ | | |
| | Spalling of concrete | | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | √ | | | | | | |
| | Seepage | | | | | √ | | | | |
| Total | | | 4 | 3 | 2 | 6 | 0 | 1 | 3 | |
| 18 | Crack | Milli Tower Mijdi bazaar road, House no-26, Road no-07, Maijde Sadar, Noakhali | √ | | √ | √ | | | | 10 |
| | Rising Dampness | | | | √ | √ | | | | |
| | Peeling paint | | √ | √ | | √ | | √ | | |
| | Fungi attack | | | | | √ | | √ | | |
| | Moisture in the air | | | | √ | | | √ | | |
| | Spalling of concrete | | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| | Seepage | | | | √ | √ | | | | |
| Total | | | 4 | 1 | 4 | 7 | 0 | 1 | 2 | |
| 19 | Crack | Khan villa Dotter hat, House no-01, Road no-04, Maijde Sadar, Noakhali | √ | √ | | √ | | | | 10 |
| | Rising Dampness | | | | | √ | | √ | | |
| | Peeling paint | | | √ | | √ | | √ | | |
| | Fungi attack | | | | | √ | | √ | | |
| | Moisture in the air | | | | √ | | | √ | | |
| | Spalling of concrete | | √ | | | | | √ | | |
| | Tilting | | √ | | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| | Seepage | | | | | √ | | | | |
| Total | | | 3 | 2 | 1 | 7 | 0 | 1 | 4 | |
| 20 | Crack | Nur Monjil Station road, House no-11, Road no-02, Maijde Sadar, Noakhali | √ | √ | | √ | | | | 07 |
| | Rising Dampness | | | | | √ | | √ | | |
| | Peeling paint | | √ | √ | | √ | | √ | | |
| | Fungi attack | | | | | √ | | √ | | |
| | Moisture in the air | | | | √ | | | √ | | |
| | Spalling of concrete | | √ | | | | | √ | | |
| | Tilting | | | √ | | √ | | | | |
| | Efflorescence | | | | | √ | | | | |
| | Seepage | | | | | √ | | | | |
| Total | | | 3 | 3 | 1 | 7 | 0 | 1 | 3 | |

Table 2 Individual Building Deffect Summary

| Storied No | Defected components | | | | Possible causes | | |
|----------------------|---------------------|-----------|-----------|------------|------------------|-------------------|------------------|
| | Column | Beam | Slab | Wall | Poor Workmanship | Defects Materials | Natural Disaster |
| Building No_1 | 3 | 2 | 1 | 7 | 0 | 1 | 4 |
| Building No_2 | 4 | 2 | 1 | 7 | 0 | 1 | 3 |
| Building No_3 | 4 | 1 | 3 | 7 | 0 | 1 | 2 |
| Building No_4 | 3 | 2 | 1 | 7 | 0 | 2 | 4 |
| Building No_5 | 4 | 2 | 1 | 7 | 0 | 1 | 3 |
| Building No_6 | 4 | 1 | 3 | 7 | 0 | 1 | 2 |
| Building No_7 | 3 | 2 | 1 | 7 | 0 | 2 | 4 |
| Building No_8 | 4 | 2 | 1 | 7 | 0 | 1 | 3 |
| Building No_9 | 4 | 1 | 3 | 7 | 0 | 1 | 2 |
| Building No_10 | 3 | 2 | 1 | 7 | 1 | 1 | 4 |
| Building No_11 | 4 | 2 | 1 | 7 | 0 | 1 | 3 |
| Building No_12 | 4 | 1 | 3 | 7 | 0 | 1 | 2 |
| Building No_13 | 3 | 2 | 1 | 7 | 1 | 1 | 4 |
| Building No_14 | 4 | 2 | 1 | 7 | 0 | 1 | 3 |
| Building No_15 | 4 | 1 | 3 | 7 | 1 | 1 | 2 |
| Building No_16 | 3 | 2 | 1 | 7 | 1 | 2 | 4 |
| Building No_17 | 4 | 3 | 2 | 6 | 0 | 1 | 3 |
| Building No_18 | 4 | 1 | 4 | 7 | 0 | 1 | 2 |
| Building No_19 | 3 | 2 | 1 | 7 | 0 | 1 | 4 |
| Building No_20 | 3 | 3 | 1 | 7 | 0 | 1 | 3 |
| Overall Total | 72 | 36 | 34 | 139 | 4 | 23 | 61 |

Table 3 Total Number of Individual Defect Summary

| Defect type | Defected components | | | | Possible causes | | | Total | Total Storied |
|----------------------|---------------------|-----------|-----------|------------|--------------------|-------------------|------------------|------------|---------------|
| | Column | Beam | Slab | Wall | Poor Work man ship | Defects Materials | Natural Disaster | | |
| Crack | 20 | 15 | 6 | 20 | - | - | - | 61 | 141 |
| Rising Dampness | | | | 20 | | 2 | 16 | 38 | |
| Peeling paint | 14 | 16 | 2 | 20 | | 3 | 20 | 75 | |
| Fungi attack | - | - | - | 19 | - | - | 7 | 26 | |
| Moisture in the air | - | - | 18 | - | - | - | 18 | 36 | |
| Spalling of concrete | 19 | 2 | - | - | 4 | 18 | - | 43 | |
| Tilting | 19 | 2 | 2 | 20 | - | - | - | 43 | |
| Efflorescence | - | 1 | - | 20 | - | - | - | 21 | |
| Seepage | - | - | 6 | 20 | - | - | - | 26 | |
| Total | 72 | 36 | 34 | 139 | 4 | 23 | 61 | 369 | |

Table 4 Final Result of Different Type of Defects

| Defect type | Percentage (%) |
|----------------------|----------------|
| Crack | 16.53% |
| Rising Dampness | 10.30% |
| Peeling paint | 20.33% |
| Fungi attack | 7.05% |
| Moisture in the air | 9.76% |
| Spalling of concrete | 11.65% |
| Tilting | 11.65% |
| Efflorescence | 5.69% |
| Seepage | 7.05% |
| Total | 100.00% |

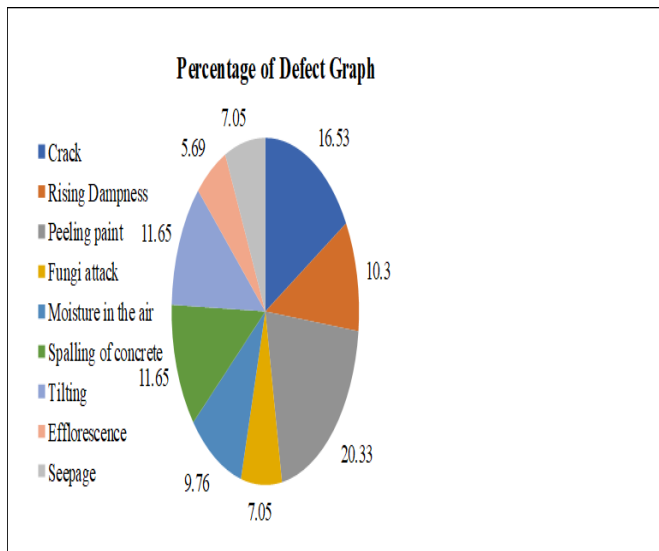


Fig 5 Over all Defected Percentage of Selected Building

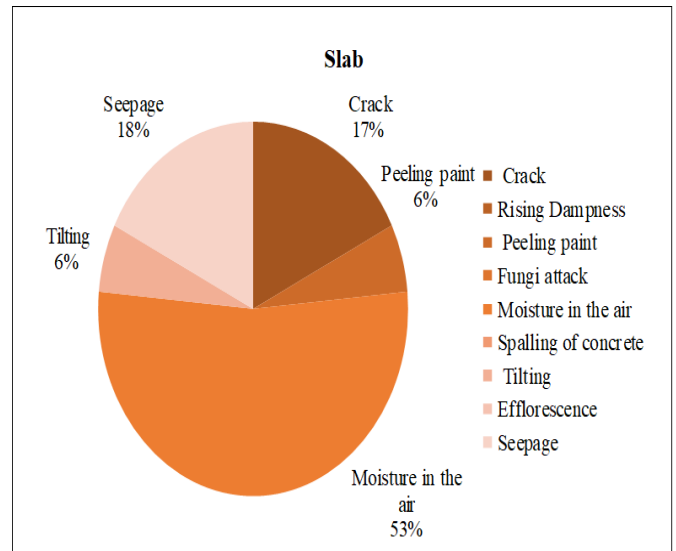


Fig 8 Different Defected Percentage in Slab

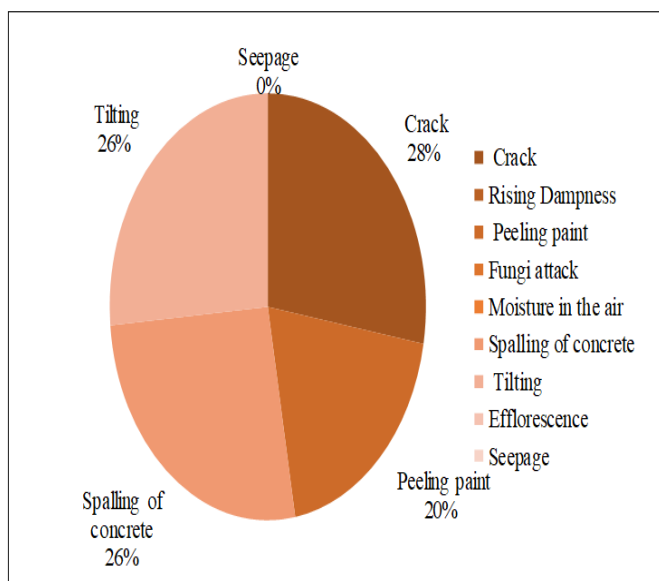


Fig 6 Different Defected Percentage of Column

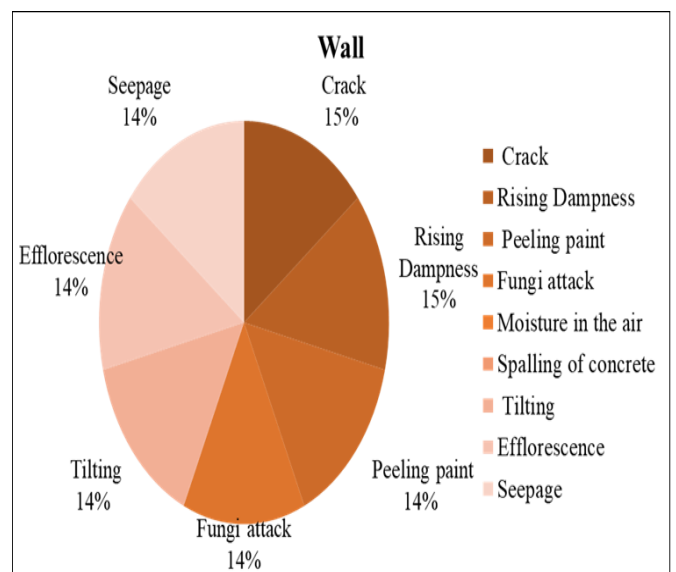


Fig 9 Different Defected Percentage of Wall

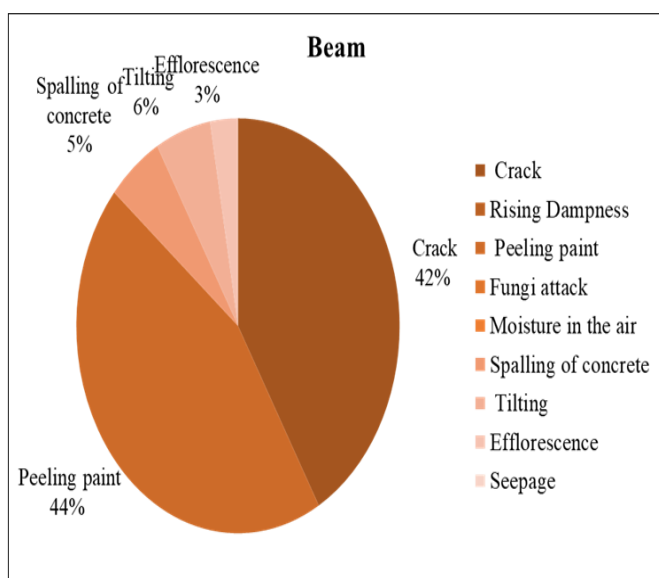


Fig 7 Different Defected Percentage in Beam

➤ *Result Analysis*

- Total Number of Building 020 Nos
- Total Number of Storied 141 Nos

➤ *Defected Components*

- Total Number of Defected Column 072 Nos
- Total Number of Defected Beam 036 Nos
- Total Number of Defected Slab 034 Nos
- Total Number of Defected Wall 139 Nos

➤ *Possible Causes*

- Total Number of Poor Workmanship 04 Nos
- Total Number of Defects Materials 23 Nos
- Total Number of Natural Disaster 61 Nos

IV. CONCLUSION

To sum up, this thesis has offered a thorough analysis of building construction flaws in Bangladesh's Noakhali Sadar Upazila. Several important conclusions have been drawn from an examination of the many kinds of flaws, their origins, and their effects on structural integrity, safety, cost considerations, legal obligations, tenant health, and public safety.

First, the study has brought attention to the high rate of construction flaws in the area, highlighting the necessity of raising awareness of and paying closer attention to quality control methods during the building process. Second, frequent causes of flaws have been discovered, which include subpar materials used, non-compliance with building norms and regulations, inadequate supervision, and poor craftsmanship.

Moreover, the thesis has emphasized the substantial financial costs linked to resolving building flaws, for both property owners and developers, in addition to the possible legal consequences arising from disagreements and obligations.

Crucially, the study has underlined how crucial it is to give structural integrity, occupant safety, and regulatory compliance first priority throughout the whole building process. It is feasible to reduce the likelihood of errors and protect the built environment in Noakhali Sadar Upazila and elsewhere by putting strict quality assurance procedures into place, improving professional training and education, and encouraging cooperation between stakeholders.

In the end, fixing building construction flaws is not just a question of technical skill; it is also a basic duty to maintain investment protection, promote sustainable growth, and maintain public safety. The goal is creating a more secure and resilient built environment for the people of through coordinated efforts and a shared dedication to excellence in construction techniques

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