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**An Assessment of the Physical Condition of Industrial
Buildings' Elements and Components in Ibadan,
Oyo State, Nigeria**

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Abstract

Maintenance of industrial buildings is indispensable to the growth and stability of an industrialised economy. This study assesses the physical conditions of industrial buildings and examines the occurrence of deterioration-prone activities in the unit operation of industries in Ibadan, Oyo State, Nigeria, with a view to enhancing the functionality of the buildings' elements and components. A purposive sampling technique was adopted to select 40 industrial buildings from three dominant industrial sectors: food, beverages, and tobacco; chemicals and pharmaceuticals, and iron and steel manufacturing, respectively. Three sets of personnel were selected per firm; these were the plant manager, senior maintenance officer, and junior maintenance officer. In essence, 120 questionnaires were administered to these officers in the identified 40 firms. The frequency distribution analysis of the occurrence of deterioration-prone activities within the production hall showed that the processing of products through conveyor lines had the index value of 3.83 and was rated 1st, followed by the changing of machines' defective parts with an index value of 3.78, the least of the deterioration prone industrial activities is the movements of cranes and jigs. The implication of this is that the floor slab and floor finishes are more prone to deterioration than other components. The analysis of the physical condition of the industrial buildings showed that the structural elements were

rated in very good condition (62.1%), roof beams (75.6%), roof carcass (67.1%), and roof covering (56.4%). Building components subjected to daily wear and tear as a result of their involvement and interaction with unit operation were safely assumed to be in satisfactory condition (floor finishes (31.1%), wall finishes (33.4%), doors and door frames (45.5%), windows and window frames (35.5%) and the mechanical and electrical components of the industrial buildings were also rated to be in satisfactory condition (plumbing pipes, connectors, and fittings (17.9%) and electrical conduit pipes and fittings (17.9%). The study concluded that the assessment of the physical condition of the industrial building's elements and components indicates the existence of varying deterioration levels, thus making the prioritisation of the maintenance of these buildings a necessity in order to enhance their functionality and ensure a safe and conducive working environment.

Keywords: *Maintenance, Industrial buildings, Physical condition, Deterioration, Building elements, components*

1.0 Introduction

Maintenance of industrial buildings is indispensable to the growth and stability of an industrialised economy, a fact that is particularly salient in rapidly urbanising Nigerian cities such as Ibadan. The physical condition of such facilities directly influences their operational efficiency, service life, and contribution to socio-economic development (Ebekozién & Duru, 2022). Yet current maintenance practices in Nigeria are characterised by a predominantly reactive approach, which accelerates the degradation of industrial facilities and increases operational expenditures (Ogunbayo et al., 2022). Ebekozién and Duru (2022) underscore that a high proportion of Nigerian public structures, including healthcare facilities, are in poor condition because of the absence of structured maintenance systems. The observation mirrors the situation across industrial sectors, where preventive or predictive approaches remain understudied. Concurrently, occupant health is jeopardised by substandard maintenance: Odunola et al. (2025) show, through an examination of Ibadan North-East, that inadequate maintenance promotes sick building syndrome, which impinges on physical, mental, and emotional well-being—a risk also faced by occupants of poorly maintained industrial facilities in Ibadan.

Technological solutions, such as digital twin technology, have been promoted, yet their adoption remains low. Ebiloma and Aigbavboa (2025) document substantial barriers, including limited technological

adoption capacity and insufficient professional expertise that perpetuate traditional, less effective practices. In terms of the policy framework, Ikudayisi and Adegun (2025) claim that the policy of maintaining the built assets is inconsistent and that there is a lack of institutional enforcement that contributes to the decline of building infrastructure in Nigeria. The analysis conducted on green building acceleration indicates that policy gaps detrimentally impact sustainable construction practice, an effect observable in the maintenance of industrial infrastructure.

Condition surveys are recognised as critical instruments for diagnosing building status and shaping maintenance decisions; however, their application is constrained in the Nigerian context, especially within industrial estates. According to Aribigbola and Fatusin (2022), over 70% of buildings in most of the major Nigerian cities, such as Ibadan, are in poor condition or in need of significant repairs, which hinders the evidence-based intervention. Prior efforts to address extant challenges have predominantly focused on public or residential buildings, leaving industrial facilities comparatively under-researched. Dithebe et al. (2025) advocate sustainable maintenance frameworks, citing preventive maintenance planning and performance-based maintenance as essential to robust public infrastructure. Extension of such research to industrial facilities would furnish practical models for enhancing the condition of industrial infrastructure in Ibadan.

Despite the pivotal role industrial sites play in Ibadan's economic development, their physical condition is impeded by systemic neglect, reactive maintenance, technological limitations, and policy ineffectiveness. The knowledge gap created by the absence of empirical condition surveys specific to industrial buildings seriously impedes evidence-based intervention strategies. Thus, carrying out an extensive survey of the physical condition of the industrial buildings in Ibadan is essential. This kind of evaluation would produce empirical data, explain deterioration patterns, reveal the root causes of maintenance failures, and enable specific interventions to improve the performance of buildings. The practice will be in line with the need for data-driven decision-making, improving occupational health, and the sustainable management of industrial infrastructure (Muoghalu, 2025).

2.0 Literature Review

This section provides a comprehensive synthesis of scholarly works related to the maintenance and physical condition of industrial buildings,

with emphasis on Nigerian contexts and global perspectives. The review examines the key components typically assessed in industrial buildings, such as foundations, walls, roofs, floors, and building services, followed by an analysis of common defects—cracks, leaks, corrosion, and finish failures—and their underlying causes, including design errors, material deficiencies, environmental factors, and usage patterns. The section also considers the practical challenges encountered in assessing industrial structures, including accessibility limitations, inadequate maintenance records, and harsh environmental influences.

2.2 Overview of Building Condition Assessment

Building condition assessment (BCA) refers to the systematic process of evaluating the physical state of a building and its components to determine performance, safety, and remaining service life (Dithebe et al., 2025). It involves the collection of qualitative and quantitative data on structural integrity, functionality, and compliance with building standards, providing a foundation for maintenance planning and decision-making (Ogunbayo & Aigbavboa, 2022). Modern approaches emphasise not only identifying visible defects but also predicting potential failures using scientific methods and digital technologies such as Building Information Modelling (BIM) and digital twins (Ebiloma & Aigbavboa, 2025). The concept of condition assessment has evolved from basic visual inspections to comprehensive methodologies incorporating life cycle analysis (Onyike et al., 2025). It now integrates sustainability principles, recognising the environmental and economic impact of poorly maintained structures. In the Nigerian context, BCA is essential for reducing incidents of structural failure, which have been linked to poor maintenance culture and lack of regular assessments (Okunola, 2022).

The primary objectives of BCA include ensuring safety, maintaining functionality, reducing maintenance costs, and extending asset lifespan (Dithebe et al., 2025). A critical purpose is to provide data for developing preventive maintenance strategies, thereby minimising reactive maintenance interventions that are costly and disruptive (Ebekoziem & Duru, 2022). Additionally, condition assessments facilitate compliance with regulatory frameworks and sustainability standards, which are increasingly relevant in global and local construction practices (Ikudayisi & Adegun, 2025). Industrial buildings present unique challenges due to their size, complexity, and the presence of heavy-duty machinery. Hence, objectives in this context extend beyond structural soundness to include

operational reliability, worker safety, and environmental performance (Oyebanji, 2025). By incorporating diagnostic tools and predictive analytics, assessments help to forecast deterioration trends and allocate resources effectively, aligning with best practices in facility management (Alohan et al., 2023).

Industrial buildings differ from residential and commercial structures in terms of scale, load-bearing requirements, and operational demands. These buildings often house complex machinery, hazardous materials, and large workforce populations, making structural integrity critical to safety and productivity (Ogunbayo & Aigbavboa, 2022). In Ibadan, many industrial estates were developed several decades ago and now show signs of deterioration, including cracked walls, corroded steel, leaking roofs, and worn-out finishes, all of which compromise operational efficiency (Ebekoziem, 2021). Condition assessments in industrial facilities prevent catastrophic failures while ensuring adherence to occupational safety regulations. This is particularly significant given Nigeria’s history of structural collapses attributed to inadequate maintenance and monitoring (Okunola, 2022). Furthermore, global competitiveness requires Nigerian industries to adopt international best practices in facility management, which prioritise scheduled condition assessments and proactive maintenance strategies (Dithebe et al., 2025).

Table 1: Summary of the Key Objectives of Building Condition Assessments as Identified in Recent Literature

Objective	Description	Source
Safety assurance	To prevent hazards and ensure occupant safety	Dithebe et al. (2025)
Maintenance planning	To provide data for preventive maintenance and budgeting	Ogunbayo & Aigbavboa (2022)
Compliance	To meet regulatory and sustainability requirements	Ikudayisi & Adegun (2025)
Life-cycle cost optimization	To minimize overall maintenance and operational costs	Ebekoziem & Duru (2022)
Performance enhancement	To maintain structural integrity and functional efficiency	Alohan et al. (2023)

Globally, BCA practices are moving towards digital integration through smart building technologies and predictive maintenance models (Alohan et al., 2023). In developed economies, technologies like BIM, infrared

thermography, and drones are being used to enhance accuracy and reduce human error (Onyike et al., 2025). In Nigeria, however, adoption remains minimal due to lack of technical expertise, funding constraints, and resistance to innovation (Ebiloma & Aigbavboa, 2025). Despite its potential, the integration of digital twin technology in facility management faces significant obstacles, including inadequate training and infrastructure deficits (Ebiloma & Aigbavboa, 2025). Nevertheless, studies suggest that integrating digital tools with traditional assessment methods could significantly improve the accuracy and efficiency of building evaluations in Nigerian industrial facilities (Ikudayisi & Adegun, 2025). By leveraging these innovations, industries can shift from reactive maintenance to predictive strategies, ensuring optimal resource utilisation and operational resilience.

Despite increasing scholarly attention, literature reveals a lack of empirical data on condition assessment of industrial buildings in Ibadan. Most studies have focused on public facilities such as hospitals and residential estates, leaving a critical gap in industrial contexts (Ebekoziem & Duru, 2022; Ogunbayo & Aigbavboa, 2022). This gap undermines the formulation of context-specific maintenance policies and jeopardises industrial sustainability in the region. The present study addresses this gap by conducting a comprehensive survey of industrial buildings in Ibadan to assess their physical condition, identify prevalent defects, and recommend evidence-based maintenance strategies. This contribution is timely, given the pressing need to align industrial infrastructure with global sustainability and safety standards.

2.3 Key Components Assessed in Industrial Buildings

Industrial buildings are complex structures comprising multiple components that must function optimally to ensure safety, durability, and operational efficiency. Condition assessments typically focus on critical structural and non-structural elements that influence the building's performance and service life. The foundation is the most critical structural component because it transfers building loads to the ground. Defects in foundations, such as settlement cracks or soil instability, often result from poor soil conditions, inadequate design, or environmental stress (Ngcobobo et al., 2024). Floors, commonly concrete slabs in industrial buildings, are assessed for cracks, surface wear, and moisture penetration, which can compromise load-bearing capacity and worker safety (Folorunso, 2021).

Walls provide enclosure and stability, but they are prone to cracks, dampness, and material degradation due to exposure to weather and chemical agents (Oyebanji, 2025). Columns and beams form the structural framework, and defects such as spalling concrete and corroded reinforcement are common in aging industrial facilities (Ngcobo et al., 2024). These issues not only affect structural integrity but also pose severe safety risks in production environments. Roofs are among the most vulnerable components due to constant exposure to harsh environmental conditions. Leaks, corrosion of roofing sheets, and damaged trusses are frequent issues observed during assessments (Ogunnaike et al., 2025). As secondary structural components, windows and doors fulfil the critical functions of ventilation and security. Defects include broken glass, corroded frames, and faulty hinges, which impact energy efficiency and workplace comfort (Emusa, 2025). Internal and external finishes—such as paint, plaster, and floor coatings—deteriorate due to abrasion, chemical exposure, and moisture, leading to aesthetic and functional problems (Folorunso, 2021). Building services, including electrical, plumbing, and HVAC systems, are vital for industrial operations. Failures in these systems can disrupt production, cause safety hazards, and increase operational costs (Ngcobo et al., 2024).

Condition assessment ensures the early detection of component defects, facilitating proactive maintenance strategies. In industrial contexts, neglecting any of these elements can lead to operational disruptions, safety hazards, and costly repairs (Ngcobo et al., 2024; Emusa, 2025). Therefore, comprehensive evaluation of structural and service components is fundamental to industrial building maintenance programs.

2.4 Common Defects in Industrial Building Components

Industrial buildings are susceptible to various physical defects that compromise structural integrity, aesthetics, and functionality. The most prevalent issues include cracks, water leakage, corrosion, and surface finish failures, each resulting from multiple interrelated factors. Cracks are consistently ranked as the most common building defect across structural and non-structural elements (Saleh et al., 2025). They occur in foundations, walls, beams, and slabs due to design errors, poor workmanship, thermal movements, or settlement. Inadequate control joints and substandard construction materials further aggravate cracking issues (Awasho & Alemu, 2023). Cracks not only reduce aesthetic value

but can also signal deeper structural problems requiring urgent intervention.

Water leakage through roofs, walls, and plumbing systems is another widespread defect in industrial facilities. Causes include damaged roofing sheets, corroded pipelines, and poor waterproofing design (Yacob et al., 2021). Persistent leaks often lead to dampness and efflorescence, promoting fungal growth and reducing indoor air quality. In industrial settings, water intrusion can damage equipment and disrupt operations (Dithebe et al., 2025). Corrosion of steel reinforcement and metallic components is a critical issue in aging industrial buildings. It typically results from prolonged exposure to moisture, aggressive chemicals, and saline environments (Olagunju, 2021). Corroded reinforcements weaken structural members, leading to spalling of concrete and reduced load-bearing capacity. This problem is compounded in industrial environments with high humidity or chemical emissions (Waako et al., 2025). Surface finishes such as plaster, paint, and coatings deteriorate over time due to weather exposure, abrasion, and chemical attack. Peeling paint, discoloured walls, and worn-out floor finishes are common in Nigerian industrial facilities (Folorunso, 2021). Although often considered minor, these defects can accelerate structural deterioration by exposing materials to environmental stressors (Oyebanji, 2025).

Regular monitoring and timely intervention are critical to mitigate these defects and prevent progressive deterioration. Without systematic maintenance, minor defects such as cracks and leaks can evolve into severe structural failures, jeopardizing safety and increasing rehabilitation costs (Olagunju, 2021; Dithebe et al., 2025).

The accuracy and efficiency of building condition assessment (BCA) depend on several factors that influence the ability to collect reliable data, interpret structural performance, and plan maintenance strategies. These factors are particularly relevant for industrial buildings, which are complex in design and operational requirements.

2.5 Challenges in Assessing Industrial Buildings

Building condition assessment (BCA) in industrial facilities is essential but often constrained by numerous challenges in developing contexts such as Nigeria. These challenges significantly affect the accuracy, frequency, and efficiency of assessment processes. Access limitations remain a major obstacle during inspections. Industrial plants often have high-risk areas, restricted zones, or locations with large machinery

installations, making comprehensive physical inspection difficult (Sa'ad et al., 2025). Safety protocols, operational constraints, and height-related access challenges further complicate evaluations, requiring specialised equipment or technologies that are often unavailable in Nigerian industries (Olanrewaju et al., 2020). A recurring problem in Nigerian building management is the absence of accurate maintenance records and as-built documentation (Ebekoziem & Duru, 2022). The construction of many industrial buildings decades ago lacked proper documentation, leading to uncertainty regarding material specifications and historical repairs. This gap makes it difficult to predict deterioration patterns or plan preventive interventions (Ebekoziem, 2021).

Industrial buildings in regions like Ibadan are exposed to environmental stressors such as high humidity, temperature fluctuations, and chemical emissions from industrial processes. These factors accelerate corrosion, cracking, and structural fatigue, complicating assessment because deterioration occurs faster than expected (Enoguanbhor et al., 2021). Harsh environmental conditions also hinder the use of some advanced diagnostic equipment, limiting accuracy in defect detection (Adoghe et al., 2023). Industrial facilities have intricate layouts with multiple functional zones, including production floors, storage areas, and hazardous sections. This complexity requires specialised knowledge for accurate evaluation, particularly when integrating structural, mechanical, and electrical assessments (Omoragbon, 2023). Additionally, building information modelling (BIM) adoption, which could streamline such assessments, faces significant implementation barriers in Nigeria due to interoperability issues, high cost, and lack of technical expertise (Olanrewaju et al., 2020).

3.0 METHODOLOGY

3.1 Research Design

This study adopted a descriptive survey research design, employing both qualitative and quantitative approaches to assess the physical condition of industrial buildings in Ibadan, Nigeria. The primary data collection method involved the administration of questionnaires, supported by visual inspections and interviews with key facility personnel. The study aimed to generate empirical evidence regarding the condition of building components in selected industrial sectors and classify them using established condition rating systems. This mixed-method approach enabled the collection of objective visual and structural data as well as

subjective insights into the usage history, maintenance practices, and perceived defects of various building elements.

3.2 Study Area

The research was conducted in Ibadan, the capital of Oyo State, located in southwestern Nigeria. Ibadan was selected due to its significance as a historical industrial hub, housing numerous manufacturing companies spread across designated industrial zones such as the Oluyole Industrial Estate, Apata, Ring Road, and Oke Ado. These zones include a range of industries with diverse architectural typologies, construction materials, ages, and operational scales — making them suitable for a broad condition assessment study.

3.3 Target Population and Sampling Frame

The target population comprised registered industrial manufacturing facilities within Ibadan. The sampling frame was built from multiple official sources:

- 82 manufacturing industries registered under the Manufacturers Association of Nigeria (MAN)
- 92 additional industries listed under the Ibadan Chambers of Commerce, Industry, Mines and Agriculture (ICCIMA)

Of the 174 industries initially identified, only 87 were actively engaged in physical manufacturing operations from identifiable industrial buildings. These 87 facilities were deemed eligible for sampling.

3.4 Sampling Technique and Sample Size

A purposive sampling technique was adopted to select a final sample of 40 industrial buildings. These 40 buildings were drawn from three dominant industrial sectors:

1. Food, Beverages, and Tobacco
2. Chemicals and Pharmaceuticals
3. Iron and Steel Manufacturing

These sectors were selected due to their high physical infrastructure intensity, relatively consistent operation, and broader representation of Ibadan's industrial economy. Three sets of personnel were selected per firm; these were the plant manager, senior maintenance officer and junior

maintenance officer. In essence, 120 questionnaires were administered to these officers in the identified 40 firms.

3.5 Data Collection Instruments and Techniques

Data collection employed three main instruments: a visual condition assessment checklist, a structured questionnaire, and a condition rating system. The structured checklist was developed to guide the visual inspection of building components. The checklist was based on frameworks from Vanier (2001), Kallen (2007), and Akinsola (2010). It covered the following component categories: floors, floor finishes, walls, wall finishes, doors and windows, roof structural members and roof covering, electrical fixtures and fittings, and plumbing pipes and accessories. Each item on the checklist was scored using a 5-point condition rating scale.

A copy of each of the questionnaire was administered to facility managers, maintenance officers and junior maintenance officer. This supplemented the visual inspections with insider knowledge and maintenance history. The study also employed a modified 5-point rating scale adapted from the Dutch Bridge Condition Assessment system by Kallen (2007) and previous building condition survey models by Vanier (2001). The scale was interpreted as shown in Table 2.

Table 2: Dutch Bridge Condition Assessment System

Rating	Condition	Interpretation
1	Very Good	No noticeable damage or defect. As-new performance.
2	Good	Minor signs of wear or early-stage damage.
3	Reasonable	Performance not significantly compromised.
4	Mediocre	Serious degradation affecting usability or safety.
5	Very Bad	Advanced damage with critical failure potential.

Each component assessed was assigned a condition rating based on visual observation and corroborated with feedback from facility staff.

3.6 Data Analysis Techniques

The collected data were analysed using descriptive statistics: Frequency counts and percentage distributions were computed for each condition rating across component types. Ratings for each component category (walls, roofs, floors, etc.) were tabulated for comparative analysis.

Microsoft Excel and SPSS software were used for data entry, sorting, and graphical output generation.

3.7 Ethical Considerations

Permission was sought from each facility's management before inspections were conducted. Confidentiality of all information and photographs was maintained. No facility names or identifiable operational details were disclosed in any public output. The research was strictly for academic and planning purposes.

4.0 Data Analysis and Discussion of Results

The general information about the respondents to the questionnaires is presented in Table 3. The distribution of the types of industry shows that eighteen (18) were in the food, beverage, and tobacco industrial sector, representing 66.7% of the population; six (6) in the chemical and pharmaceutical industrial sector, representing 22.2%; and three (3) in the basic metal, iron, and steel industrial sector, representing 11.1%.

The academic qualification of the respondents showed that 44.3% were OND/HND holders, 44.3% were bachelor's degree holders, and 11.4% were master's degree holders. Based on these academic qualifications, the respondents were deemed to possess adequate academic training to supply reliable data for this study. The working experience of the respondents revealed that 6.6% had less than two years of working experience, 23.0% had between 2 – 4 years of working experience, 18.0% had 5 – 7 years of working experience, 23.0% had 8 – 10 years of working experience, and 29.0% had over 10 years of working experience. Consequently, the respondents' work experience profile indicates sufficient industry experience, suggesting the information provided is both reliable and dependable.

In the job designation, Table 2 showed that 8.2% of the respondents were quality controller, 16.4% were production engineers, 50.8% were supervisors, 16.4% were mechanical engineers while 4.9% were junior maintenance staff. The result also shows that the respondents hold requisite positions in their respective industries to enable them to adequately respond to the need of the research.

On the nature of business setup, the analysis revealed that 3.3% of the industries sampled were sole proprietorships, 4.9% were partnerships, 52.5% were limited liability company while 39.3% were

public liability company. The results show that the industries sampled were licensed and incorporated under the Companies and Allied Matters Act 1990 to practice in the country and fit to adequately provide useful information germane to the success of the research.

Table 3: General Information about the Respondents

Respondents	Frequency	Percent
Types of industry		
Food, beverages, and tobacco	18	66.7
Chemical and Pharmaceutical	6	22.2
Metal production	3	11.1
Academic Qualification		
OND/HND	27	44.3
B.Sc	27	44.3
M.Sc	7	11.4
Working experience		
Less than 2 years	4	6.6
2-4 years	14	23.0
5-7 years	11	18.0
8-10 years	14	23.0
Above 10 years	18	29.4
Job designation		
Builder	Nil	0
Quality Controller	5	8.2
Estate Manager	Nil	0
Material Engineer	2	3.3
Production Engineer	10	16.4
Supervisor	31	50.8
Mechanical Engineer	10	16.4
Junior Maintenance Staff	3	4.9
Nature of business set up		
Sole proprietorship	2	3.3
Partnership	3	4.9
Limited Liability Company	32	52.5
Public Liability Company	24	39.3

4.1 General Information about the Unit Operation

The general information about the respondents' response to questions bordering on the unit operation in the production area is presented in Table 4. 80.0% of the respondents sampled operate on shift, while 19.7% do not, in respect of the number of people working per day. Regarding workforce size, the majority (50.7%) of organisations operate with more than 50 employees. The remaining organizations are distributed as

follows: 6.6% (less than 10), 6.6% (11–20), 8.2% (21–30), 14.8% (31–40), and 13.1% (41–50)

The analysis of the unit operation further revealed that 21.3% of the industries operate manually while 67.2% operate automated system. As regards the mode of moving finished products from the production area to storage, 72.1% of the respondents used forklifts while 27.9% moved finished products manually. 62.3% of the respondents experienced vibration of machines during the unit operations, while 37.7% responded otherwise. 23.0% of the respondents experienced gas pollution during unit operation, while 77.0% did not, 57.4% experienced spillage of chemicals, grease and oil while 44.3% answered negatively. Regarding the spillage of hot water and steam during unit operation, 55.7% of the industries experienced steam and hot water spillage, while 44.3% did not. 83.6% of the industries experienced noise pollution, while 21.3% did not. 78.7% of industries experienced installation of additional machines, and 21.3% did not. 83.6% of the industries experienced the removal of obsolete machines, while 16.4% did not. 29.5% experienced spatial expansion of the production area, while 70.5% did not.

Table 4: General Information about the Unit Operation

Respondent	Frequency	Percent
Work shift capability		
Yes	49	80.3
No	12	19.7
Numbers of people working per day		
Less than 10	4	6.6
11 – 20	4	6.6
21 – 30	5	8.2
31 – 40	9	14.8
41 – 50	8	13.1
More than 50	31	50.7
Mode of plant operation		
Manual	13	21.3
Automated	41	67.2
Others	7	11.5
Mode of moving finished products to store		
Forklift	44	72.1
Manual	17	27.9
Others	Nil	
<i>Do you experience vibration of the machines?</i>		
Yes	38	62.3
No	23	37.7
<i>Do you experience gas pollution?</i>		
Yes	14	23.0

No	47	77.0
Do you experience spillage of chemicals, grease, and oil?		
Yes	35	57.4
No	26	42.6
Do you experience steam or hot or cold water spillage?		
Yes	34	55.7
No	27	44.3
Do you experience noise pollution?		
Yes	51	83.6
No	10	16.4
Have you experienced bringing an additional machine?		
Yes	48	78.7
No	13	21.3
Have you experienced the removal of obsolete machines?		
Yes	51	83.6
No	10	16.4
Have you experienced spatial expansion of the production area?		
Yes	18	29.5
No	43	70.5

It could be deduced from Table 4 that industrial activities within the study area were enormous and varied (working of machines, movement of forklifts, emission of pollutant gases, spillage of grease and oil, among other activities) according to the size of the industry in terms of the products and services being offered.

4.3 Assessment of the Physical Condition of Industrial Buildings

The analysis of the physical condition of the industrial buildings is presented in Table 5. Table 4 shows that the structural elements were rated in very good condition (columns (62.1%), roof beams (75.6%), roof carcass (67.1%), and roof covering (56.4%)). Building components subjected to daily wear and tear as a result of their involvement and interaction with unit operation were safely assumed to be in satisfactory condition (floor finishes (31.1%), wall finishes (33.4%), doors and door frames (45.5%), windows and window frames (35.5%), the mechanical and electrical components of the industrial buildings were also rated to be in satisfactory condition (plumbing pipes, connectors, and fittings (17.9%) and electrical conduit pipes and fittings (17.9%)).

The ranking of the physical condition of the building elements and components shows that the roof beams were in the best state of structural health with an index value of 4.645, while wall finishes with an index value of 3.641 came last (12th). This implies that the structural components exhibited less deterioration than other building elements because concrete, provided its production and placement adhere to code provisions, typically exhibits greater strength over time (Ikpo, 2006).

Table 5: Analysis of the Physical Condition of Industrial Building Elements and Components

Building elements and components	Very good	Good	Satisfactory	Fair	Poor	Index	Rank
Roof beams	76%	13%	11%	0%	0%	4.645	1
Roof carcass	67%	16%	11%	6%	0%	4.45	2
Columns	62%	22%	11%	4%	0%	4.422	3
Floor slab	33%	53%	13%	0%	0%	4.2	4
Roof covering	56%	13%	23%	8%	0%	4.179	5
Wall	38%	31%	24%	7%	0%	4	6
Electrical conduit pipes and fittings	36%	36%	18%	10%	0%	3.974	7
Plumbing pipes, connectors and fittings	39%	28%	18%	15%	0%	3.898	8
Floor finishes	27%	36%	31%	7%	0%	3.824	9
Door and door frames	19%	33%	46%	2%	0%	3.69	10
Windows and window frames	21%	35%	36%	9%	0%	3.676	11
Wall finishes	24%	29%	33%	13%	0%	3.641	12

Table 6: Frequency Analysis of the Occurrence of Deterioration-Prone Activities

Industrial activities	Very infrequent	Infrequent	Average	Frequent	Very frequent	Index	Rank
Processing of products through conveyor line	9%	11%	18%	17%	46%	3.83	1
Changing of machines defective parts	4%	9%	20%	34%	32%	3.78	2
Movement of forklift	13%	9%	16%	25%	38%	3.69	3
Machine servicing	7%	11%	20%	32%	30%	3.67	4
Spillage of chemicals, grease, and oil	10%	12%	18%	29%	31%	3.59	5
Spatial expansion of production area	11%	18%	29%	27%	16%	3.22	6
Vibration of machines	21%	14%	12%	26%	26%	3.19	7
Addition of new machines	13%	24%	31%	20%	11%	2.89	8
Noise pollution	27%	18%	27%	13%	16%	2.76	9
Removal of obsolete machines	23%	31%	30%	7%	9%	2.48	10
Gas pollution	31%	29%	23%	13%	5%	2.35	11
Spillage of steam, hot or cold water	20%	38%	33%	7%	2%	2.33	12
Movement of crane and jig	38%	32%	14%	4%	11%	2.15	13

The frequency distribution analysis of the occurrence of deterioration-prone activities within the production hall is presented in Table 6. The relative importance index of these activities showed that the processing of products through conveyor lines had the index value of 3.83 and was rated 1st among the deterioration-prone industrial activities, followed by the changing of machines' defective parts with an index value of 3.78. The least of the deterioration-prone industrial activities is the movement of cranes and jigs. Consequently, the floor slab and floor finishes are more prone to deterioration than other components. Movement of cranes and jigs according to Derek (1994), causes fatigue stress in columns and roof beams, which incidentally is the least frequently occurring industrial activity prone to injury as viewed by the respondents; this could be due to the fact that the industries studied are not into the production of heavy equipment that needs to be hoisted using cranes.

5.0 Conclusion

The maintenance survey of the industrial buildings in the study area revealed that the industries varied unit operations involving movement of raw and finished products using automated and manual systems, vibration of machines, removal and replacement of obsolete machines, occasional pipe bursts, forklift and crane movements, and extension of production area, which induced wear and tear on the floor and floor finish, walls, and the roof structure. The assessment of the physical condition of the industrial building's elements and components indicates the existence of varying deterioration levels, thus making the prioritisation of the maintenance of these buildings a necessity in order to enhance their functionality and ensure a safe and conducive working environment.

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