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EVALUATING THE EFFECTIVENESS OF BUILDING MAINTENANCE STRATEGY IN TERTIARY INSTITUTION: A CASE STUDY OF AIR FORCE INSTITUTE OF TECHNOLOGY KADUNA

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Abstract

This research examines the structural condition and management of facilities used in the Air Force Institute of Technology (AFIT) in Kaduna, Nigeria. A field assessment that utilizes the rebound hammer test integrated with the survey results of the students and working staff supported the evaluation of the concrete structures' condition and the current maintenance systems. The research shows that there is a disparity of elements of concrete quality in different structures; however, some deserve consideration and retrofit. In the survey respondents which expressed general dissatisfaction with current practices of maintenance, and there is a need to conduct more frequent and effective maintenance inspections, increase the number of employees in the department, and improve the reporting systems. Based on the findings of the study, the recommendations advanced on AFIT building maintenance are; Implementing preventive maintenance

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programs and programs on quality assurance. Implementing modern maintenance tools and personnel training.The above extensive measures will help reduce the risks and guarantee the reliability and friendliness of all AFIT structures to foster a learning environment.

Introduction

The Air Force Technical Institute (AFIT) in Kaduna, Nigeria is the leading institution dedicated to upgrading technical knowledge and skills in the Nigerian Air Force and other affiliated services established to provide technical education will enable AFIT to play a vital role in training personnel supporting operational capacity of the the Nigerian military Schools, libraries, administrative offices, residential areas And there are, all require regular and systematic maintenance to ensured continuous operation, safety and suitability for learning Building maintenance at AFIT and other universities is an important part of facility management ensuring the longevity, safety and operation of the facilities Effective maintenance practices not only provide physical conditions of building maintenance on Many Nigerian university institutions including AFIT not only improve, they face many challenges that can compromise the quality and safety of the workplace (Agyekum, Ayarkwa). & Adinyira, 2021). One of the main challenges in building maintenance at AFIT is funding limitations. In Nigeria, third-party organizations often operate under severe financial constraints, with limited maintenance budgets. This budget constraint can lead to deferred maintenance, where necessary repairs and maintenance are delayed due to lack of funds, leading to progressive deterioration of infrastructure over time deferred maintenance can turn into issues that are more costly requiring significant capital investments to manage them, increasing the financial burden of the organization (Karim et al., 2021).

In addition to the economic crisis, finding skilled workers is another major challenge. Effective building maintenance requires professionals who are not only well-trained in various maintenance tasks but are also familiar with modern maintenance procedures and technologies. Unfortunately, many top-tier organizations including AFIT, struggle to attract and retain skilled maintenance professionals due to the competitive job market and lack of

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career development opportunities within the institution. This shortage can lead to substandard work (Nduka, 2021).

Furthermore, infrastructure inefficiencies can further compound maintenance challenges at the AFIT site. Effective maintenance is the planning, design, and execution of maintenance activities, supported by accurate record-keeping and monitoring systems but many organizations lack robust maintenance plans and technical tools required to provide maintenance services Skills they do not have Proactive Maintenance -There may be some processes, where maintenance is only done in response to failure, rather than preventive maintenance that anticipates potential problems and deals with them before they become critical size (Akinolu et al., 2020).

Environmental factors also play a role in maintenance challenges. The location of AFIT in Kaduna exposes its projects to various environmental stresses, such as severe weather, possible moisture, and flooding these environmental forces for rapid wetting and surface of building materials and systems, besides requiring frequent and difficult maintenance efforts Additional pressure on organizational maintenance capacity may result (Farahani et al., 2020).).

The importance of proper management in learning institutions cannot be overstated. Well-appointed facilities not only provide a safe and comfortable environment for students, staff, staff, and visitors but also contribute to the institution's reputation and efficiency. Effective maintenance can enhance campus aesthetics, reduce the risk of accidents and health hazards, and ensure uninterrupted delivery of educational services conversely, poor maintenance can accelerate the deterioration of the buildings.

Given these challenges, there is a critical need to examine the effectiveness of AFIT's current building maintenance program. Understanding the strengths and weaknesses of existing maintenance practices is essential to developing targeted interventions that can address identified gaps and drive overall maintenance outcomes effectiveness. Recent research has emphasized the need for a comprehensive and proactive maintenance program that includes regular inspections, planned maintenance activities, and prompt maintenance,

with adequately funded, independent personnel and mature, and efficient management (Karim et al., 2021; Nduka, 2021).

This project discusses the challenges faced by the Nigerian Air Force Institute of Technology (AFIT) regarding its construction and maintenance strategies, highlighting the inadequacies in current policies that hinder effective facility management. It emphasizes the need for regular inspections and systematic maintenance to ensure the integrity and functionality of the buildings.The study aims to evaluate AFIT's construction renovation strategy, analyze maintenance practices, and identify challenges while proposing recommendations to enhance safety, support academic excellence, and reduce long-term costs. The significance of the study lies in its potential to inform policy decisions and contribute to the literature on building maintenance in tertiary institutions.

An evaluation of the AFIT building maintenance program includes examining current maintenance practices, identifying specific challenges faced by the organization, and assessing the effectiveness of existing strategies in achieving maintenance goals. By overcoming maintenance challenges and planning for improvements, AFIT will be able to ensure the longevity, safety, and functionality of its infrastructure, and therefore support its educational mission and operational capabilities.

This research evaluates the effectiveness of building maintenance strategies at the Air Force Institute of Technology (AFIT). Aiming to identify the challenges and successes of current maintenance practices, providing a comparative analysis of various techniques and their cost implications. By focusing specifically on AFIT, the study seeks to fill a research gap in the existing literature, offering tailored recommendations for improving maintenance strategies in Nigerian tertiary institutions. Ultimately, this research contributes to enhancing the overall quality and sustainability of the built environment within educational settings

METHODOLOGY

This technique section gives an in-depth account of the approaches and techniques used to assess the structural integrity and maintenance necessities of various buildings at the Air Force Institute of Technology (AFIT). The non-destructive checking out (NDT) method, in particular the rebound hammer method, became used to assess the concrete first-class and ensure the safety and sturdiness of the LR lecture rooms, boys' hostel, and women's hostel. The following sections describe the records series methods, based totally on the findings.

Survey and Feedback Collection

To supplement the technical statistics, an established survey turned into conducted among college students and a body of workers to gather comments on the preservation conditions and their impact on the mastering environment.

Survey Design

Objective: To recognize the perceptions and studies of constructing customers concerning renovation practices and structural conditions

i. Questionnaire Development: A detailed questionnaire has evolved, masking components such as preservation frequency, the impact of constructing conditions on getting to know, and areas requiring development.
ii. Distribution: The survey turned into disbursed electronically and in paper form to ensure extensive participation.
iii. Data Collection: Responses had been accumulated over two weeks, with reminders sent to encourage participation.

Data Collection

Non-Destructive Testing (NDT) Techniques

Non-adverse checking out is a crucial process in assessing the integrity and best of building substances without inflicting damage. The rebound hammer check

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was selected for this challenge because of its effectiveness in measuring the surface hardness of concrete, which correlates with compressive electricity.

Rebound Hammer Test:

Objective: To examine the floor hardness and estimate the compressive strength of concrete structures in the AFIT buildings.

Equipment: Schmidt rebound hammer, a non-damaging trying-out device.

Procedure:

Preparation: The concrete surfaces to be examined had been wiped clean and organized to ensure correct readings.

Positioning: The rebound hammer becomes located perpendicular to the floor at every take-a-look-at factor.

Measurement: Multiple readings have been taken at numerous locations, consisting of columns, beams, and slabs within the LR classrooms, boys' hostel, and ladies' hostel.

Recording: Each analysis was recorded, and the average rebound wide variety for each unique web page was calculated to decide the general surface hardness.

RESULTS AND DISCUSSION

Results

Questionnaire Results

Below is a table summarizing the responses collected from the Google Form questionnaire regarding building maintenance at the Air Force Institute of Technology (AFIT). From tables 4.1 to 4.15 the graph of each is attached to the data needed and the code for the graph is in the appendix.

Table 4.1 Gender Distribution

Gender	Percentage
Male	86%
Female	13.6%

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Table 4.2 Academic Level Distribution

Level	Percentage
100L	18.2%
200L	10%
300L	21.8%
400L	14.5%
500L	35.5%

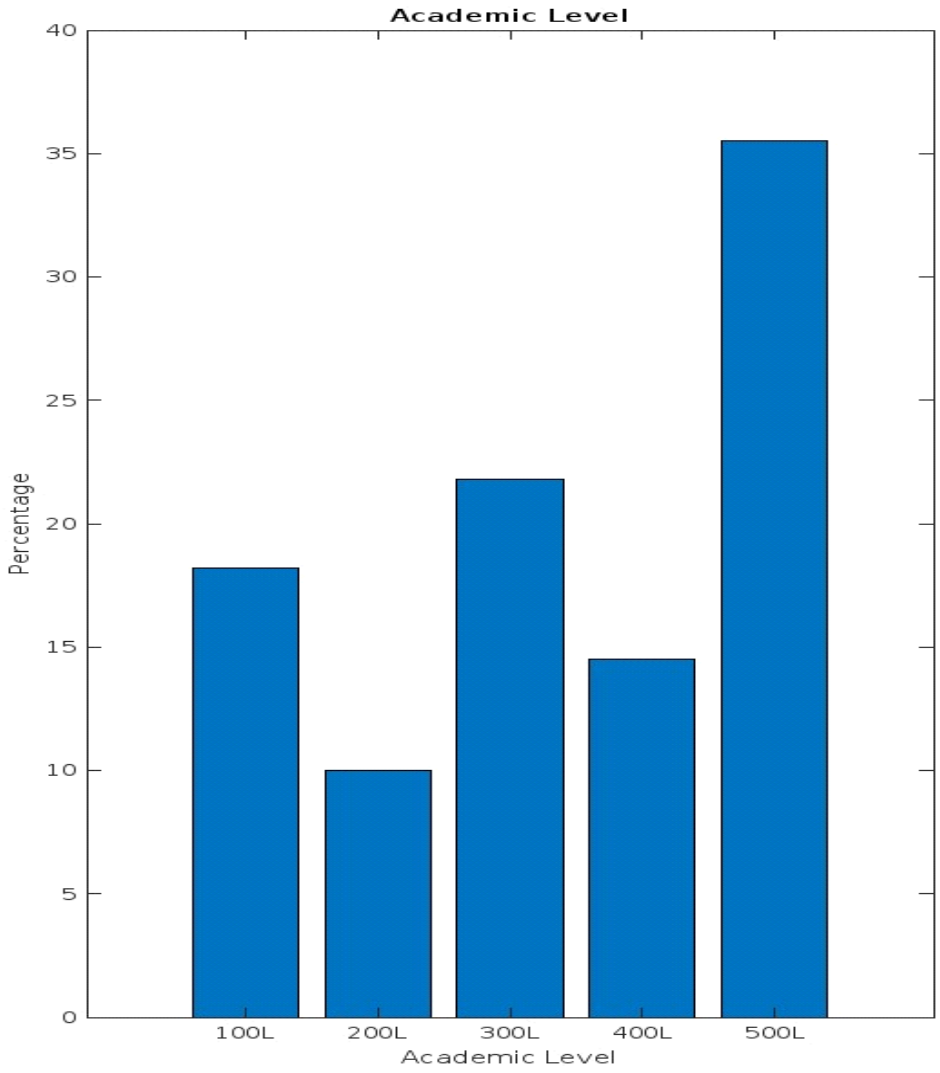
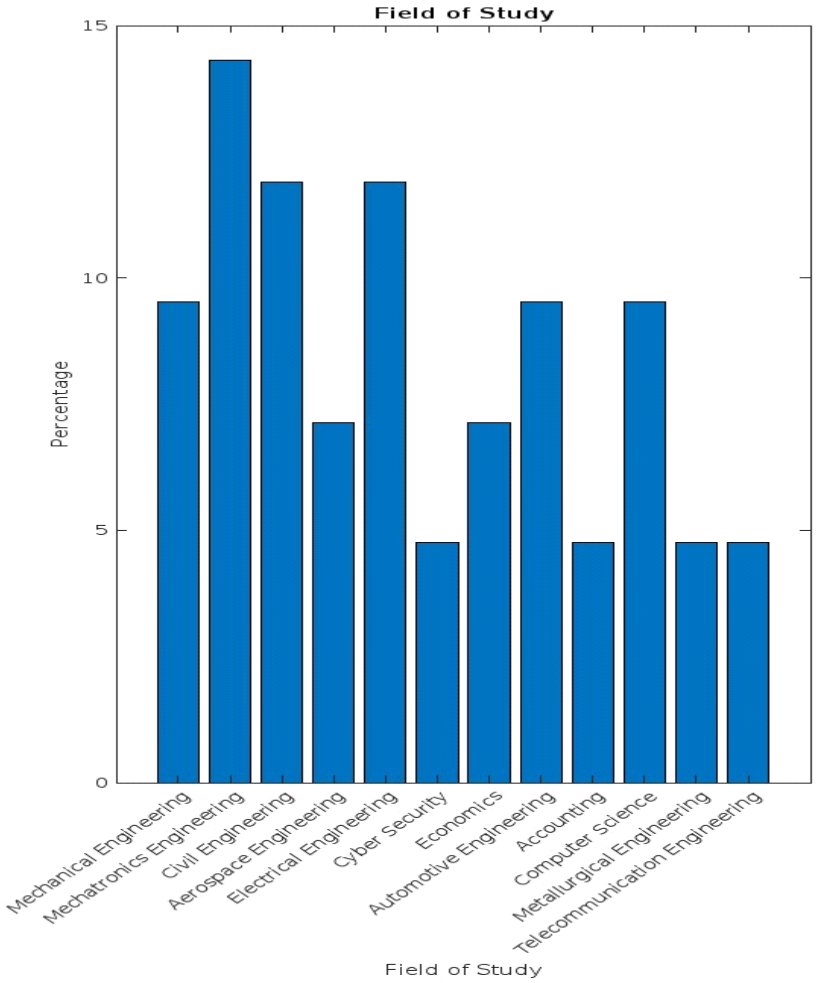


Table 4.3 Field of Study Distribution

Field	Percentage
Mechanical Engineering	9.52%
Civil Engineering	11.9%
Aerospace Engineering	7.14%
Electrical Engineering	11.90%
Cyber Security	4.76%
Economics	7.14%
Automotive Engineering	9.52%
Mechatronics Engineering	14.32%
Accounting	4.76%
Computer Science	9.52%
Metallurgical Engineering	4.76%
Telecommunication Engineering	4.76%



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Table 4.4 Adequacy of Building Maintenance

Response	Percentage
Yes	40%
No	60%

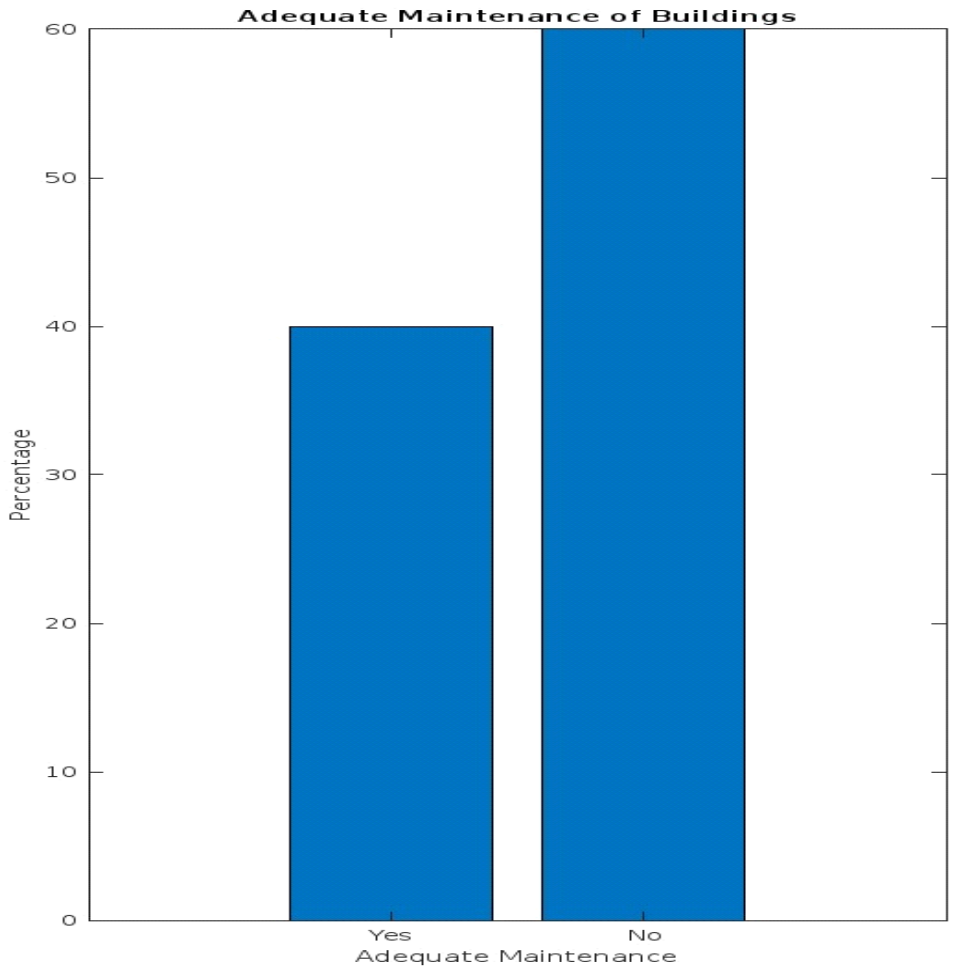


Table 4.5 Satisfaction with Building Conditions

Response	Percentage
Neutral	45.5%
Disagree	17.3%
Agree	30.9%
Strongly Agree	2%
Strongly Disagree	4.3%

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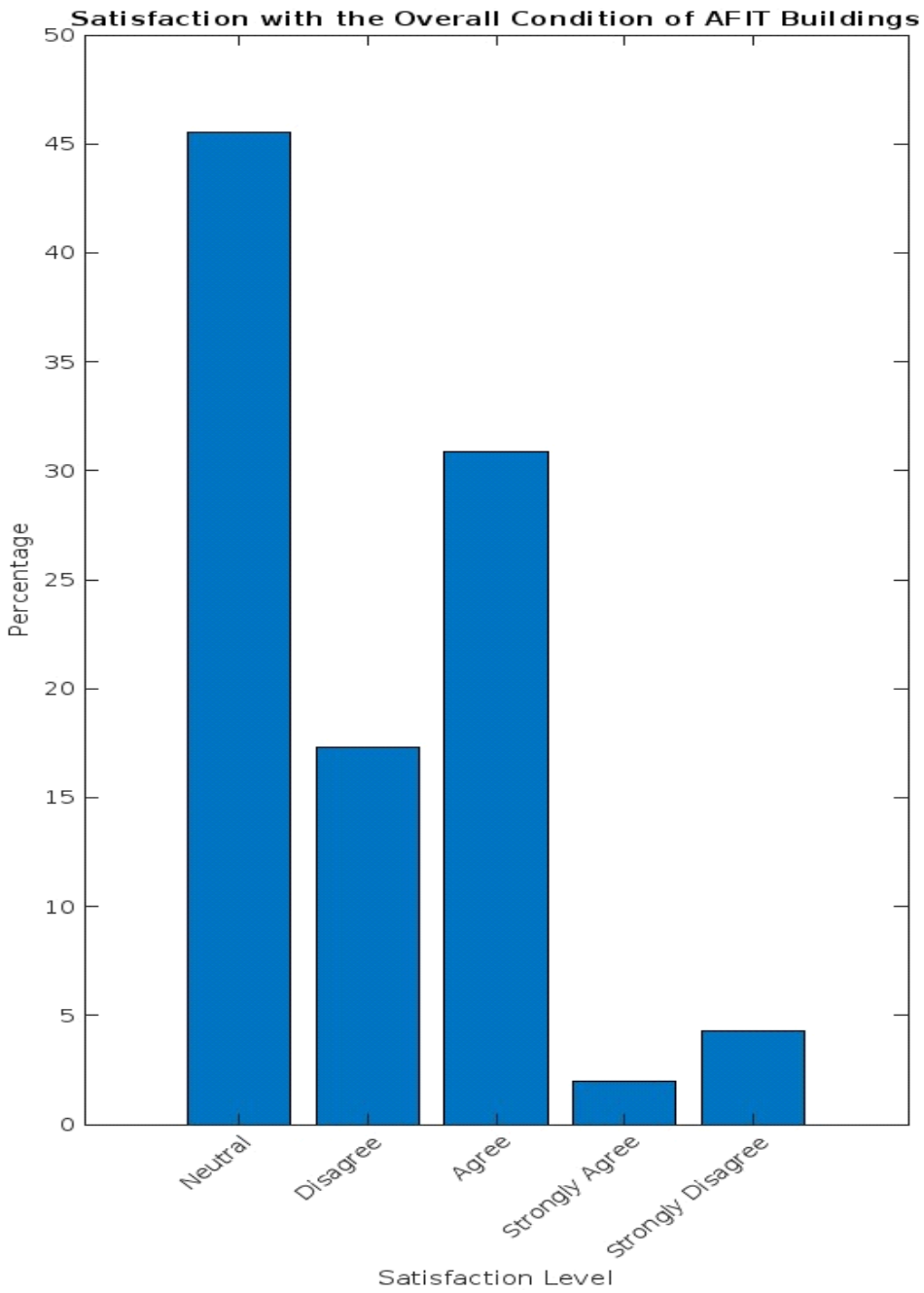


Table 4.6 Adequacy of Maintenance Professionals

Response	Percentage
Yes	30%
No	70%

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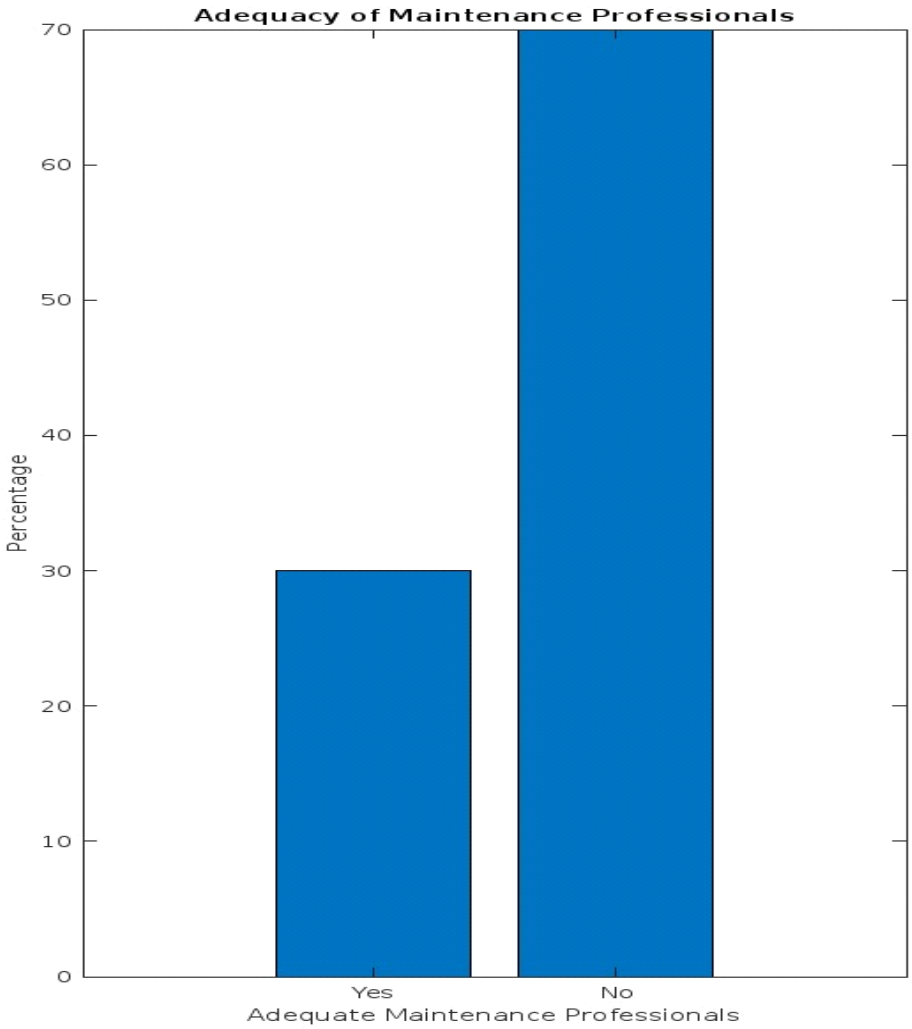


Table 4.7 Standard of Maintenance Activities

Response	Percentage
Strongly Disagree	8.2%
Disagree	34.5%
Neutral	38.2%
Agree	17.3%
Strongly Agree	1.8%

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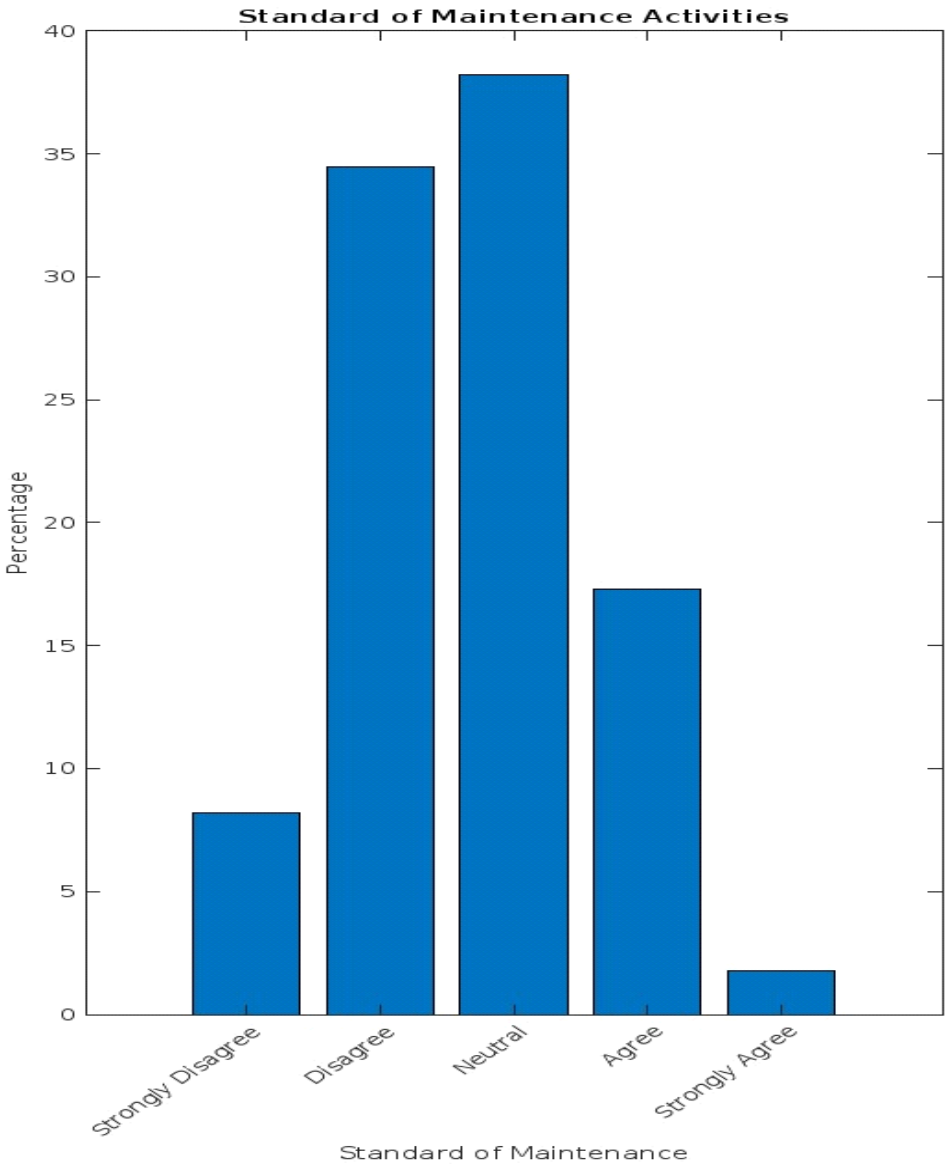


Table 4.8 Frequency of Reporting Maintenance Issues

Response	Percentage
Often	11.8%
Sometimes	11.8%
Rarely	28.2%
Never	46.4%
Always	1.8%

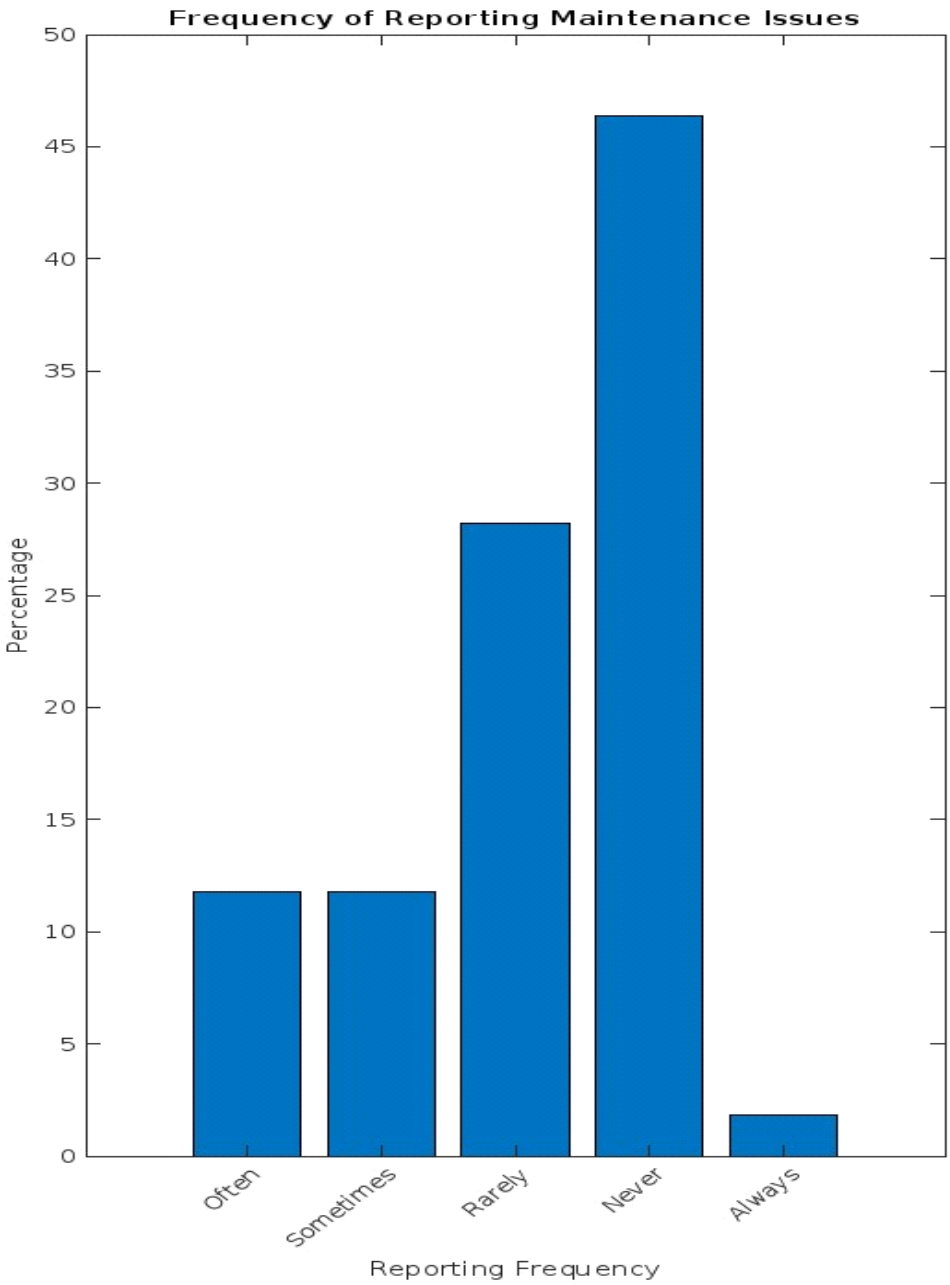


Table 4.9 Impact of Building Conditions on Learning Experience

Response	Percentage
Yes	65.5%
No	34.5%

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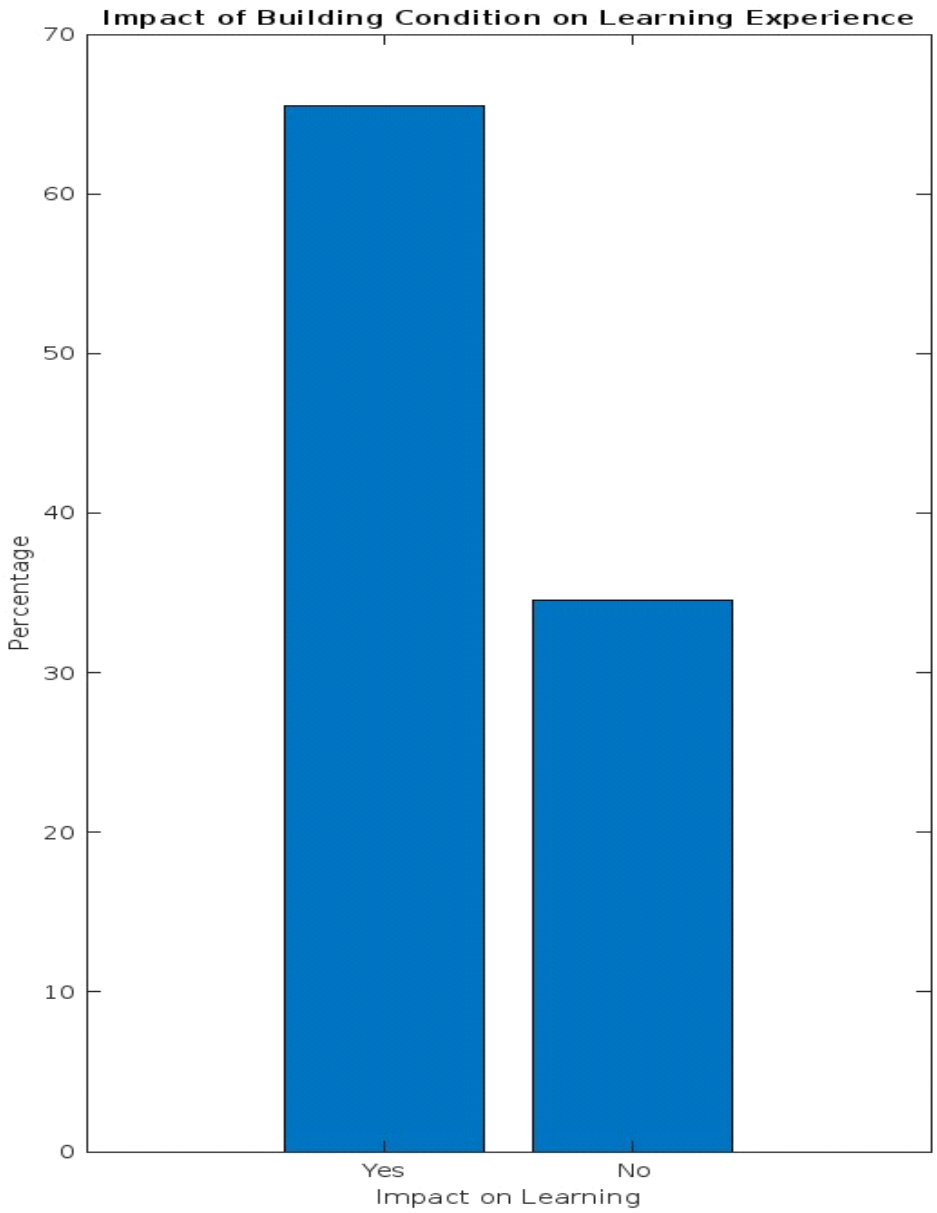


Table 4.10 Impact of Maintenance Issues on Class Attendance

Response	Percentage
Yes	25.5%
No	74.5%

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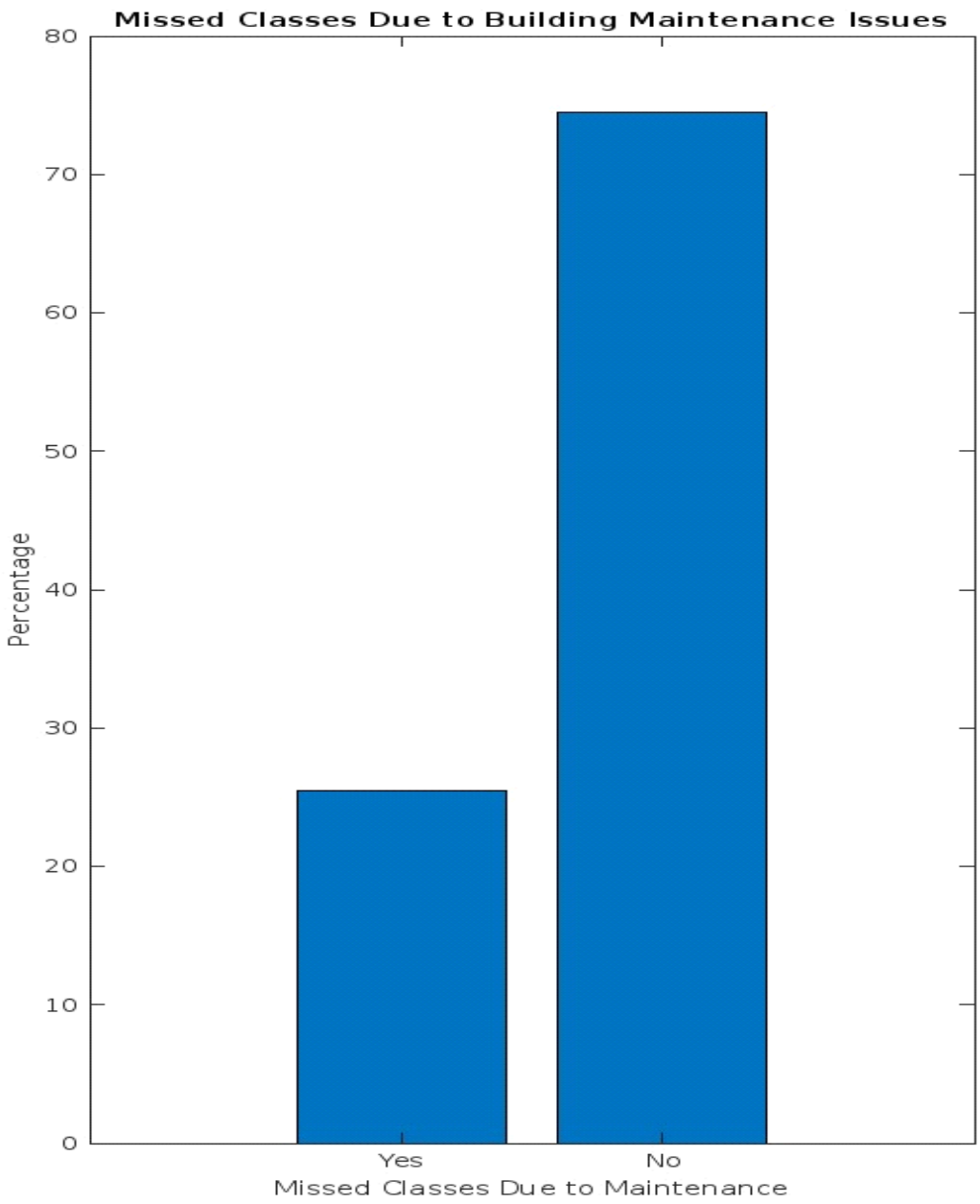


Table 4.11 Overall Maintenance Satisfaction

Response	Percentage
Yes	43.5%
No	56.4%

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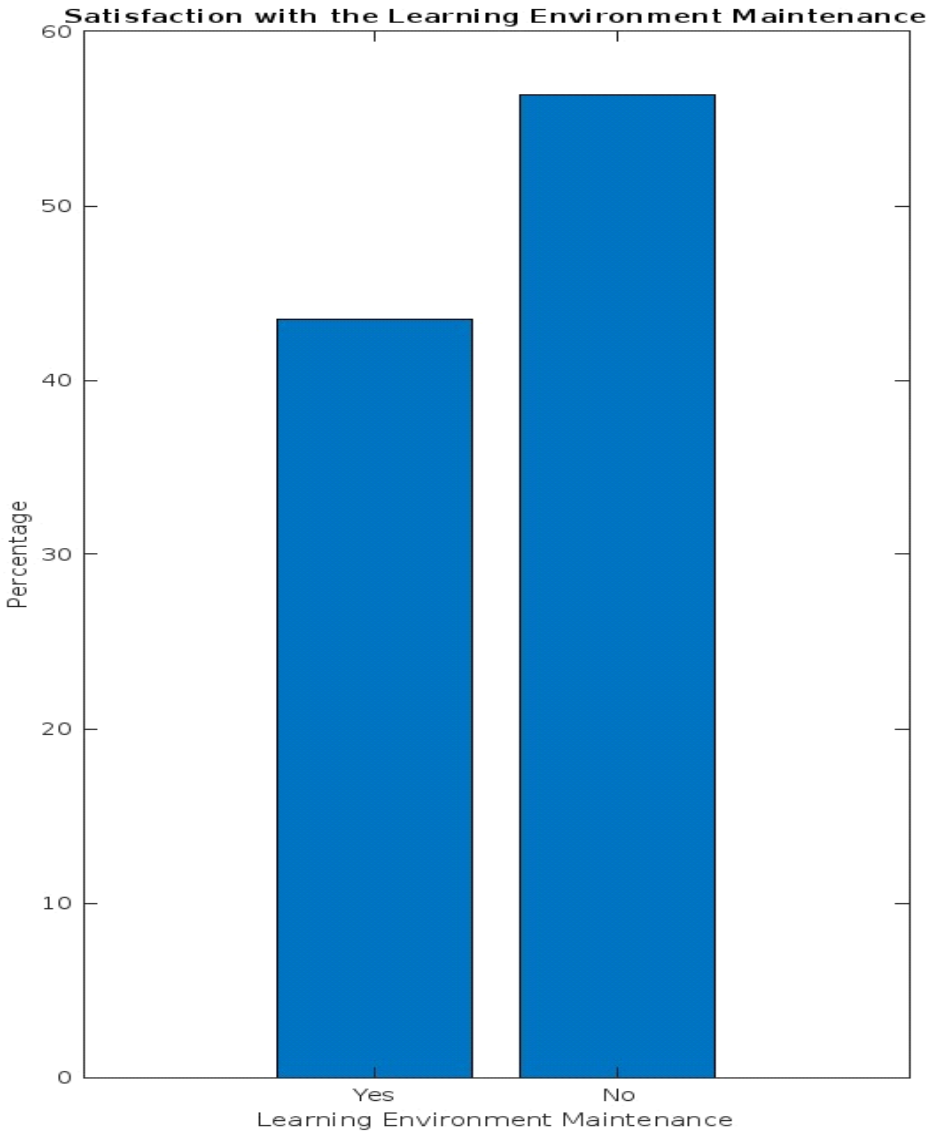


Table 4.12 Areas for Maintenance Improvement

Area
Hostel (especially toilet)
Lecture Hall (A, B, and C)
Boys Hostels (Roof)
Lecture rooms

Table 4.13 Specific Area Needing Attention

Area
Hostels (especially boys hostels)
Lecture Halls
LR 191, 192, and 193.
Plumbing works

Table 4.14 Suggestions for Improving Reporting Issues

Suggestions
Monthly inspections of AFIT buildings
Suggestion box
Setting up a committee on building maintenance
Routine maintenance check
Frequent check-up on buildings to ensure usability

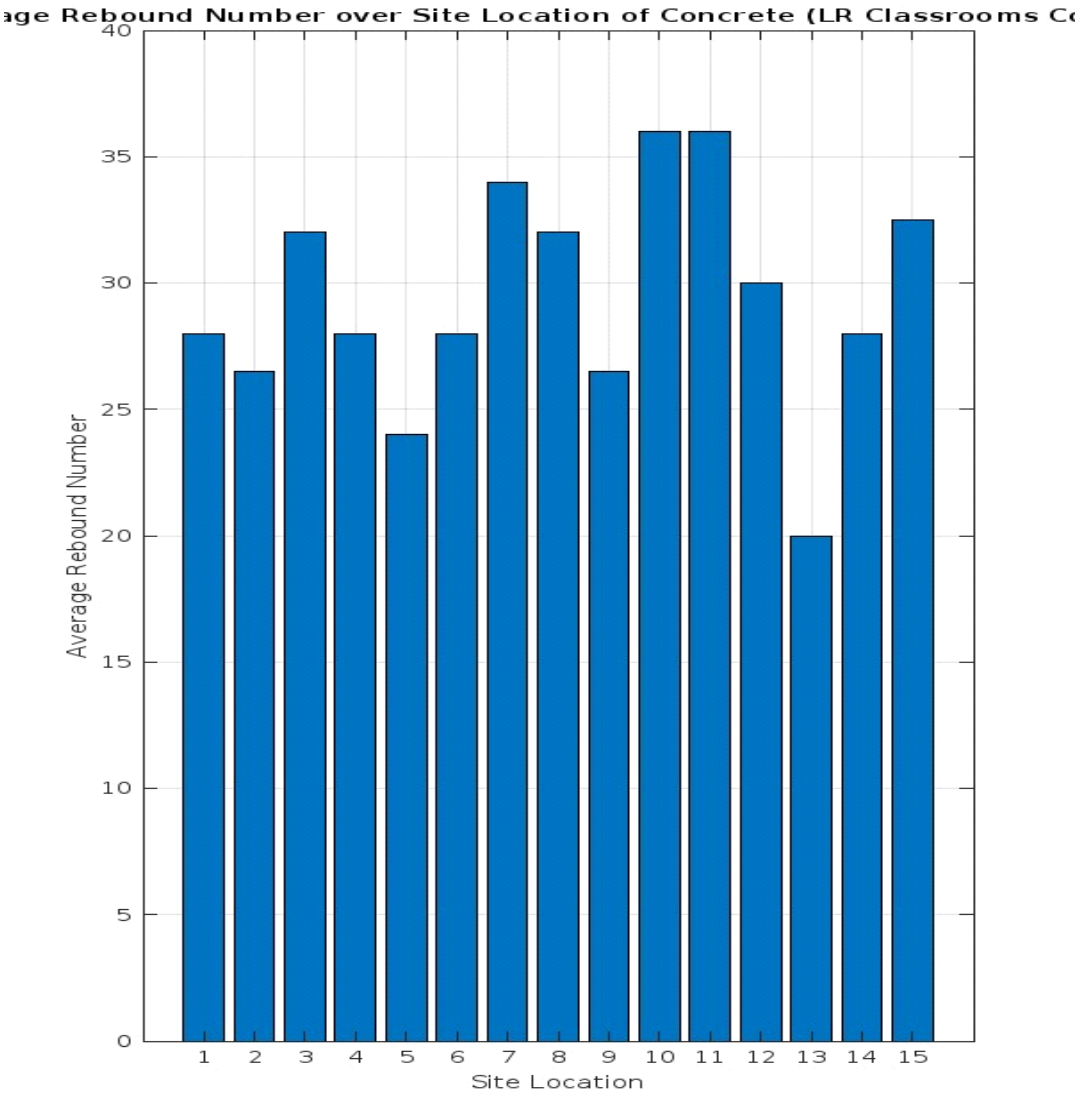
Non-destructive testing (NDT):

Is a crucial method for evaluating the integrity and properties of concrete structures without causing damage. This report analyzes the result of NDT carried out at Air Force Institute of Technology (AFIT) buildings, specifically focusing on the LR classrooms, boys' hostels, and girls' hostels. The test was performed using the rebound hammer method, which indicates the surface hardness of the concrete, correlating to its compressive strength. The recorded data will be presented in tables from 4.15 to 4.21

Tables 4.15 Rebound Number for LR Classrooms (Columns)

Site Location Section of Concrete	Average Rebound Number
1	28.00
2	26.50
3	32.02
4	28.00
5	24.00
6	28.00
7	34.00
8	32.00
9	26.50
10	36.00
11	36.00
12	30.00
13	20.00
14	28.00
15	32.50

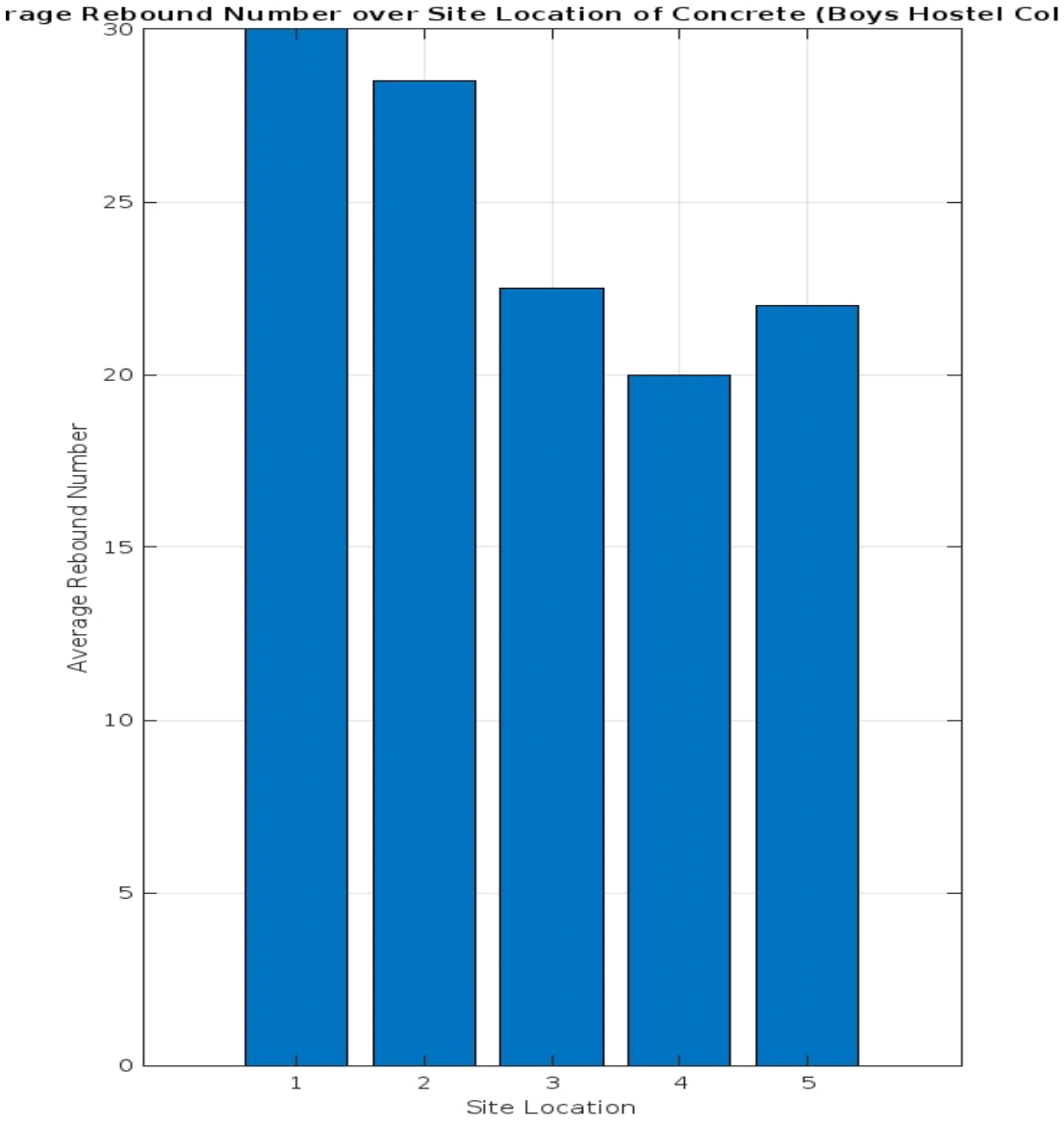
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Tables 4.16 Rebound Number for Boys Hostel (Columns)

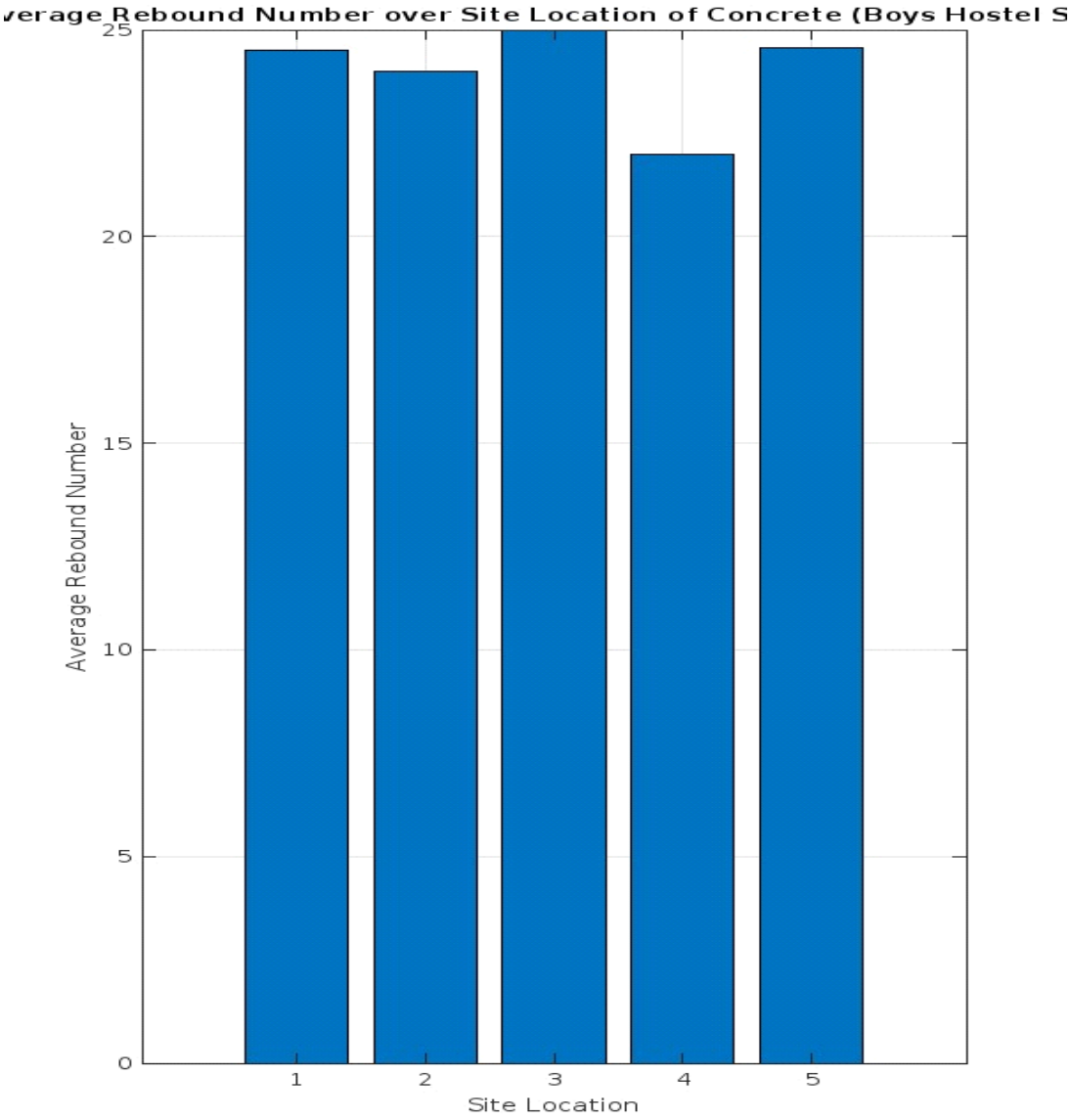
Site Location Section of Concrete	Average Rebound Number
1	30.00
2	28.50
3	22.50
4	20.00
5	22.00

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Tables 4.17 Rebound Number for Boys Hostel (Slab)

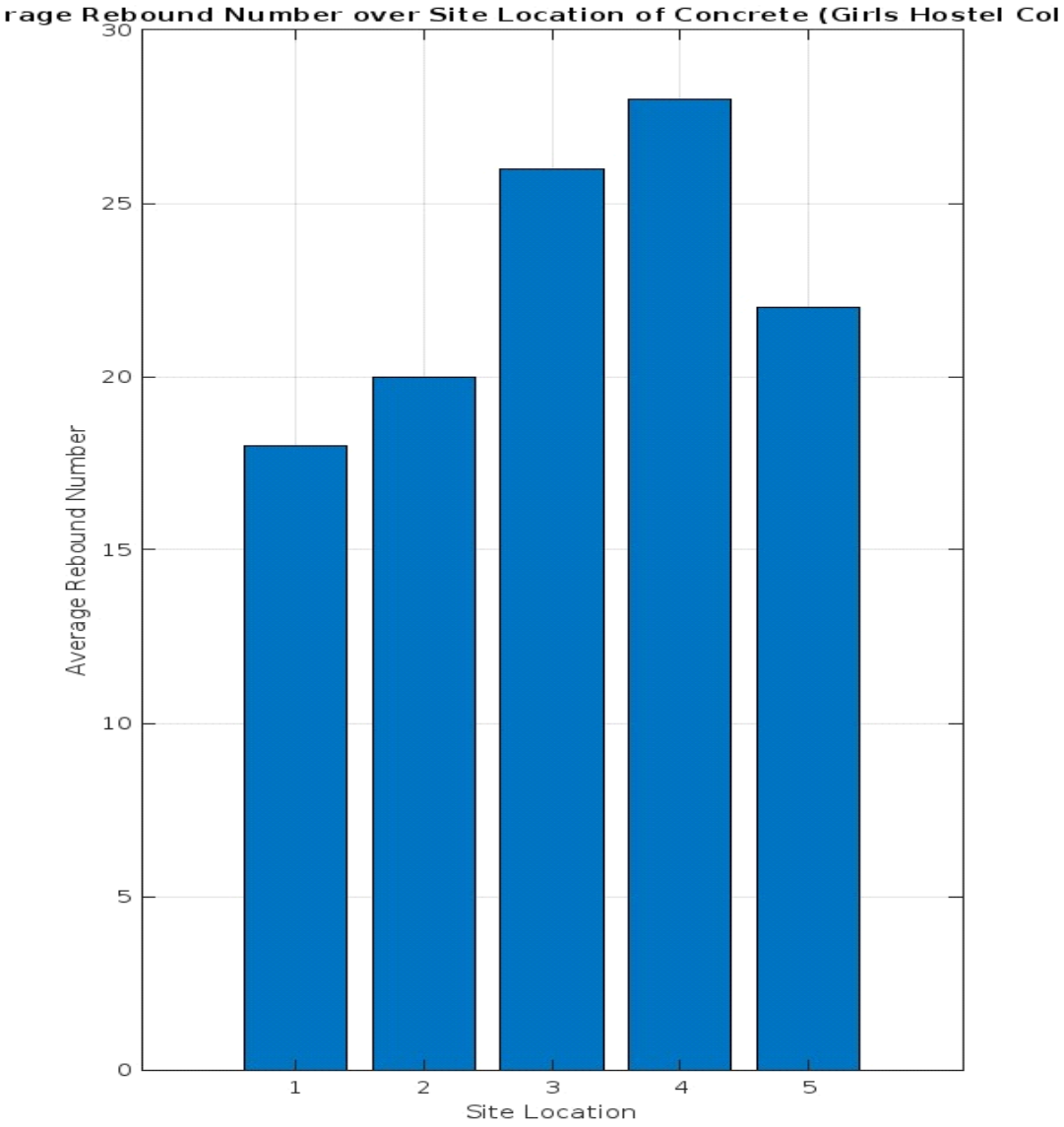
Site Location Section of Concrete	Average Rebound Number
1	24.50
2	24.00
3	25.00
4	22.00
5	24.58



Tables 4.18 Rebound Number for Girls Hostel (Columns)

Site Location Section of Concrete	Average Rebound Number
1	18.00
2	20.00
3	26.00
4	28.00
5	22.00

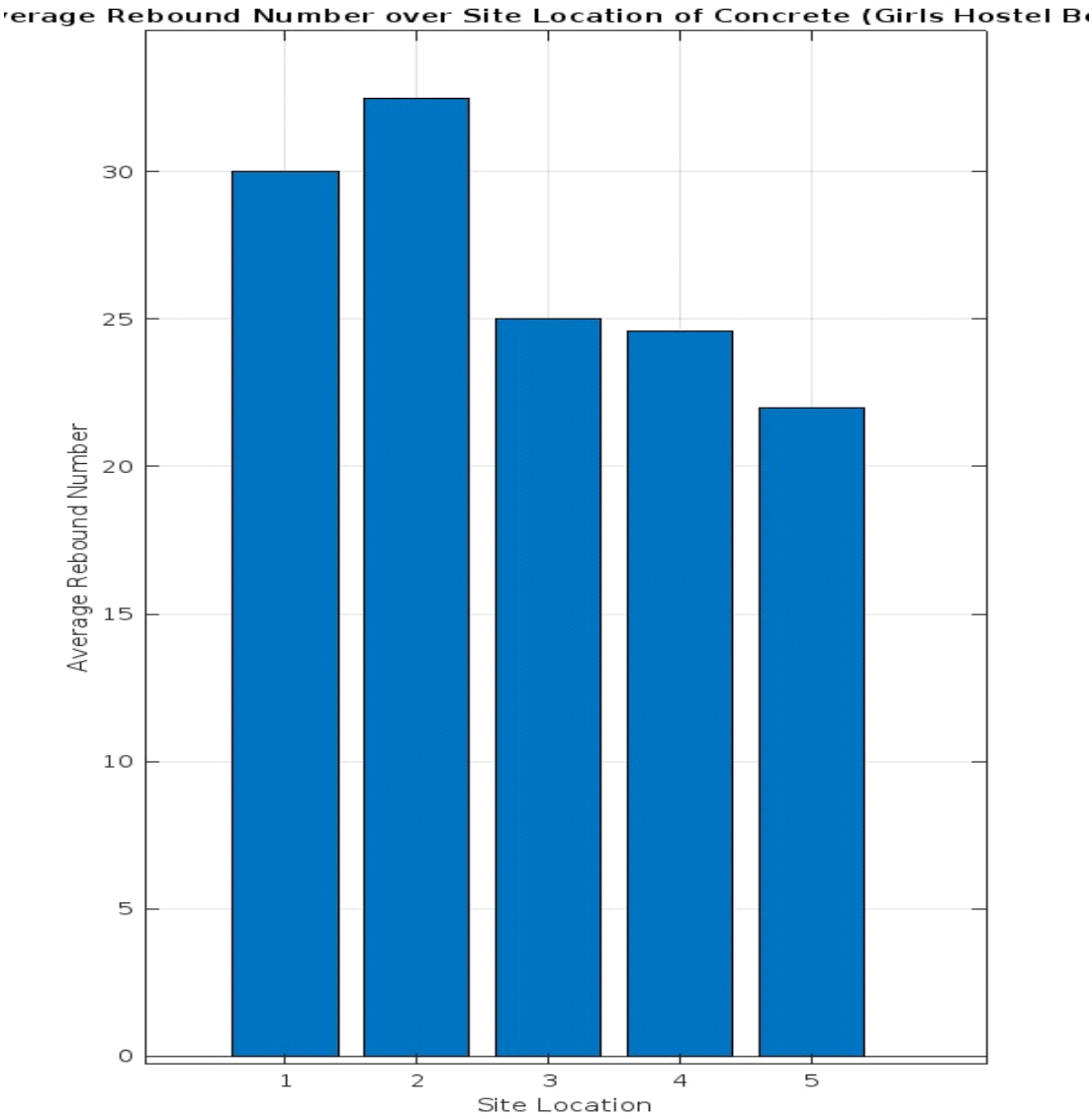
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Tables 4.19 Rebound Number for Girls Hostel (Beam)

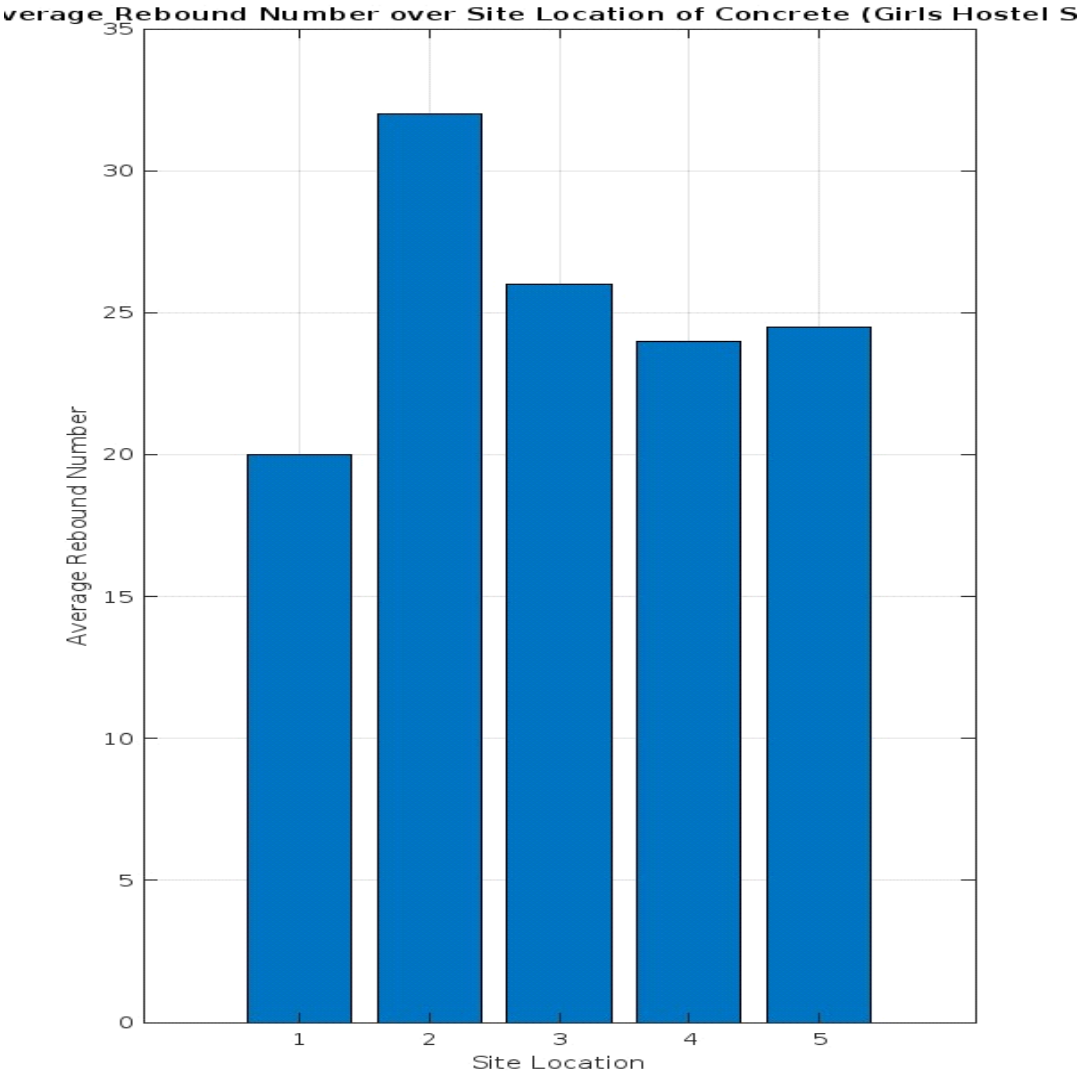
Site Location Section of Concrete	Average Rebound Number
1	30.00
2	32.50
3	25.00
4	24.58
5	22.00

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Tables 4.20 Rebound Number for Girls Hostel (Slab)

Site Location Section of Concrete	Average Rebound Number
1	20.00
2	32.00
3	26.00
4	24.00
5	24.50



Standard Data for Rebound Number

The rebound hammer test, also known as the Schmidt hammer test, is a widely used non-destructive test method for evaluating the surface hardness of concrete. The rebound number can correlated to the compressive strength of concrete. The tables below provide standard data for rebound numbers and their corresponding compressive strength, which are generally accepted internationally.

Table 4.21 Standard Data for Rebound Number and Compressive Strength

Rebound Number	Compressive Strength	Description
10-15	5-10	Very low strength
16-20	10-15	Low strength
21-25	15-20	Moderate strength
26-30	20-25	Satisfactory for most applications
31-35	25-30	Good strength
36-40	30-35	Very good strength
41-45	35-40	High strength
46-50	40-45	Very high strength
51-55	45-50	Extremely high strength
56-60	50-55	Exceptional strength

Sources.
ASTM C805/C805M-18
BS EN 12504-2:2012
ACI 228.1R-03

Discussion of the Results

Questionnaire Discussion

The gender distribution in this survey reveals a large skew closer to male respondents, with 86% figuring out as male and best 13.6% as girl. This isn't always uncommon in engineering institutions in which male students often outnumber female college students. The low percentage of female students highlights the need for tasks to inspire greater ladies to pursue engineering and related fields. Institutions should bear in mind growing scholarships, mentorship programs, and outreach sports geared toward high-faculty ladies to enhance gender diversity.

The educational stage distribution indicates a concentration of respondents from their very last year (500L) with 35. Five, followed using 0.33-12 months college students (300L) at 21.Eight%. First-12 month's college students (100L) represent 18.2% of the respondents, while second-year students (200L) constitute the bottom at 10%. The excessive percentage of final-year college students suggests that they may be maximum engaged with or concerned

approximately the renovation of AFIT buildings, probably because of their extended publicity of the facilities. This insight ought to inform targeted verbal exchange and development efforts through the management.

The area of having a look at distribution suggests that Mechatronics Engineering has the highest illustration at 14.32%, followed using Civil Engineering and Electrical Engineering, every with eleven.9%. The varied distribution throughout one-of-a-kind fields of take a look at offers a large angle on renovation problems at AFIT. Lower representations in fields inclusive of Cyber Security and Accounting advise that students in those areas may additionally have much less interplay with the bodily infrastructure as compared to engineering college students, doubtlessly impacting their perspectives on building preservation.

A majority of respondents (60%) consider that AFIT homes do not receive ok maintenance interest, suggesting a substantive hole within the perceived preservation efforts. This comments shows the want for a thorough assessment of the current preservation practices and the improvement of an extra proactive strategy. Engaging students to understand their specific worries ought to provide valuable insights for addressing these issues efficaciously.

The survey outcomes display mixed satisfaction with building conditions. While forty-five. Five of the respondents are neutral, and 30.9% agree that the situation is fine. Conversely, 17. Three disagree, and 4.3% strongly disagree, indicating top-notch dissatisfaction amongst a few students. These combined comments suggest that at the same time as a few components of the buildings might be perfect, there are regions requiring pressing interest to meet the satisfaction of all students. Detailed compliance surveys ought to assist in identifying particular regions of concern.

A tremendous majority of respondents (70%) accept as true that AFIT does not have adequate preservation specialists to meet the construction maintenance necessities. This perception highlights an ability shortage of skilled protection personnel, contributing to discovered deficiencies in building renovation. Addressing this hole by way of hiring greater qualified experts or upskilling present personnel could extensively enhance maintenance requirements and make sure a higher-maintained campus environment.

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The general of renovation sports gets numerous responses. While 38.2% of respondents are impartial, a huge portion (forty-two. 7 % combined) disagrees or strongly disagrees that the usual is acceptable. Only 17.3% agree, and a trifling 1. Eight strongly agree. This feedback indicates a well-known dissatisfaction with the present-day maintenance standards, emphasizing the need for full-size improvements. Conducting ordinary protection audits and concerning college students in feedback methods ought to beautify the high-quality maintenance offerings.

The frequency of reporting upkeep troubles suggests that forty-six. Four of the respondents never file troubles, and 28.2% hardly ever do. This shows a substantial disengagement from the preservation reporting manner, in all likelihood because of a lack of information or perceived inefficacy of reporting systems. Improving the reporting mechanisms and ensuring well-timed resolution of stated troubles should encourage more college students to take part actively in the preservation method.

A majority of 65. Five of the respondents believe that the circumstance of the buildings affects their learning enjoyment, highlighting the vital importance of properly maintained centers. Poor construction conditions can negatively affect pupil awareness, consolation, and academic overall performance. Ensuring that buildings are in the exact condition is critical for creating a conducive knowledge of the environment and helping academic fulfillment.

Although a smaller portion (25. Five) of respondents have missed lessons or sports due to renovation troubles, this still represents a quarter of the scholar population. This shows that preservation problems are big sufficient to disrupt educational activities for a few college students. Addressing these problems promptly can reduce disruptions and ensure that scholars can attend lessons often without predicament.

A majority of respondents (fifty-six. 4%) feel that the mastering environment isn't well maintained, highlighting preferred dissatisfaction with the cutting-edge country of maintenance. This comments suggests big room for development in retaining the learning environment to fulfill the expectancies and desires of the scholars. Implementing ordinary protection schedules and responsive restore structures should enhance usual satisfaction.

The regions highlighted for maintenance development consist of hostels (specifically toilets and roofs), lecture halls, and school rooms. These areas are

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crucial to the daily existence of students, and their protection at once influences pupil consolation and academic performance. Prioritizing these regions for preservation can notably enhance the dwelling and gain knowledge of conditions at AFIT. Regular inspections and well-timed maintenance in those key regions could result in stepped-forward pupil pleasure and better academic consequences.

Respondents have especially pointed out lecture halls, boys' hostels, school lavatories, sure classrooms (LR 191, LR 192, LR 193, and LR 194), and plumbing works as regions needing interest. These regions are critical to each educational and residential lifestyle. Addressing these unique issues can greatly enhance scholar delight and the overall functionality of the centers. Focusing on these areas for protection efforts will likely have a big positive impact on the scholar.

Suggestions for improving the reporting of preservation issues encompass month-to-month inspections, putting in place suggestion containers, forming a building preservation committee, accomplishing habitual maintenance checks, and common constructing inspections. Implementing these guidelines can create an extra proactive and responsive maintenance gadget, ensuring that problems are identified and addressed right away. By regarding students within the reporting and remarks method, the administration can ensure that upkeep troubles are fast and efficaciously resolved.

Overall Analysis

The survey responses offer a complete view of the present-day country of building upkeep at AFIT from the angle of the students and workforce. The information highlights numerous key regions of challenge, consisting of the adequacy of maintenance specialists, the same old protection sports, and the effect of building conditions on students' getting-to-know reports.

4.2 Rebound Hammer Discussion

Rebound Numbers 2000 to 2400: These values imply low to slight compressive energy (10-20 MPa) Locations with those numbers, which include web page 4. Thirteen may have concrete this is much less appropriate for high load-bearing packages and might require in addition research or reinforcement

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Rebound Numbers 2500 to 3000: These values recommend fine compressive strength (20-25 MPa) Most of the places fall within this range, indicating the concrete is generally adequate for traditional structural packages

Rebound Numbers 3100 to 3500: These values correspond to proper compressive energy (25-30 MPa) Locations along with websites three, 7, and eight show strong concrete, suitable for maximum structural purposes

Rebound Numbers 3600: These values indicate excellent compressive power (30-35 MPa) Locations 10 and eleven are particularly strong, suggesting first-rate concrete at these points

Overall, the concrete inside the LR classrooms suggests variability, with most sections indicating pleasant to good compressive strength, whilst a few locations might also require further checking out to ensure protection

Columns:

i. Rebound Numbers 2000 to 2250: Indicate low to moderate compressive power (10-20 MPa) Locations 3, 4, and five would possibly have weaker concrete, requiring additional examination
ii. Rebound Numbers 2850 to 3000: Indicate high-quality to good compressive energy (20-30 MPa) Locations 1 and a couple of advocates ok concrete best

Slabs:

i. Rebound Numbers 2200 to 2500: Indicate moderate to excellent compressive strength (15-25 MPa) All recorded values fall within this variety, suggesting the slabs have uniform and ok power
ii. The boys' hostel typically shows the best compressive power for the slabs, at the same time as the columns exhibit greater variability with a few potentially weaker sections

Columns:

1. Rebound Numbers 1800 to 2200: Indicate low to slight compressive power (10-20 MPa) Locations 1, 2, and five suggest weaker concrete
2. Rebound Numbers 2600 to 2800: Indicate pleasant compressive energy (20-25 MPa) Locations three and 4 propose stronger concrete

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Beams:

i. Rebound Numbers 2400 to 3250: Indicate first-class to exact compressive strength (20-30 MPa) Locations 1 to 5 display adequate to excellent concrete pleasant, with places 1 and a pair showing the best strengths

Slabs:

i. Rebound Numbers 2000 to 3200: Indicate low to top compressive strength (10-30 MPa) the range in rebound numbers shows differences in the satisfaction of concrete across places, with place 2 showing mainly strong concrete

The girls' hostel presentations significant variability in the rebound numbers throughout columns, beams, and slabs, indicating differences in concrete first-rate the beams commonly showcase higher electricity in comparison to columns and slabs

CONCLUSION AND RECOMMENDATION

Conclusion

Maintenance Concern in AFIT

To address the preservation issues at AFIT, the administration must consider increasing the number of renovation experts, improving the usual protection sports, and enhancing the mechanisms for reporting renovation problems. Regular inspections, student involvement in upkeep remarks, and centered improvements in important regions can cause a better-maintained campus and an advanced knowledge of the environment for all students.

This comprehensive evaluation, in conjunction with the tables provided, captures the designated comments from the survey respondents, offering actionable insights for the AFIT administration to enhance their building maintenance strategies.

Nondestructive Test

The non-unfavorable testing of the use of the rebound hammer technique gives a perception of the compressive energy of concrete structures inside the AFIT buildings Based on the same old correlations, maximum sections within the LR school rooms, boys' hostel, and ladies' hostel show best to desirable

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concrete first-rate, with a few areas indicating potentially weaker concrete that requires similarly research Ensuring consistent concrete quality across all structural factors is important for keeping the integrity and safety of the homes Further checking out and appropriate preservation or reinforcement measures are advocated for areas with decrease rebound numbers.

Recommendations

Recommendations for Building Maintenance at AFIT

Increase the Frequency of Maintenance Checks

Finding: 60% of respondents trust buildings do not receive adequate upkeep.

Recommendation: Establish an everyday and complete renovation agenda to ensure that all buildings are inspected and maintained frequently. This includes recurring tests for structural integrity, plumbing, electrical structures, and standard cleanliness.

Enhance Maintenance Staffing

Finding: 70% trust there aren't enough protection professionals.

Recommendation: Hire extra protection employees to competently cover all homes. Ensure that the protection team is nicely trained and sufficient in number to cope with the preservation needs of the complete campus.

Develop a Preventive Maintenance Program

Finding: forty-five. 5% of respondents are impartial, 17. Three disagree, and four.3% strongly disagree with the satisfaction of constructing situations.

Recommendation: Implement a preventive renovation application that specializes in addressing issues before they emerge as full-size issues. This program ought to include normal inspections and timely upkeep of all construction additives.

Improve Reporting Mechanisms for Maintenance Issues

Finding: 46.4% never file troubles, and 28.2% hardly ever do.

Recommendation: Create a user-friendly and handy gadget for reporting renovation issues. This can be a cellular app or a web portal where college students and teams of workers can effortlessly publish protection requests and tune their status.

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Focus on High-Impact Areas

Finding: 65. Five agree that the constructing circumstance impacts their mastering experience.

Recommendation: Prioritize preservation in regions that immediately impact the learning environment, including lecture halls, and classrooms, and look at areas. Ensure those spaces are properly maintained to offer a conducive learning environment.

Rapid Response to Maintenance Requests

Finding: 25.5% have overlooked training or activities due to preservation issues.

Recommendation: Establish a speedy reaction group that may quickly address urgent upkeep troubles, minimizing disruption to lessons and activities. This group needs to be geared up to deal with emergencies and provide instantaneous answers.

Regular Communication and Feedback

Finding: A vast quantity of respondents are neutral or dissatisfied with the same old preservation sports.

Recommendation: Maintain open traces of communique with college students and groups of workers regarding upkeep sports. Regularly solicit remarks on preservation troubles and update the campus network on ongoing and completed preservation tasks.

Increase Maintenance of Specific Areas

Finding: Respondents recognized hostels, lecture halls, and lavatories as wanting development.

Recommendation: Allocate additional resources and awareness to the preservation of excessive-use regions inclusive of hostels, lecture halls, and lavatories. Ensure those areas get hold of ordinary and thorough upkeep to improve overall situations.

Implement a Quality Assurance Program

Finding: Dissatisfaction with upkeep requirements.

Recommendation: Develop a nice warranty software to frequently evaluate and improve preservation practices. This application ought to consist of

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everyday audits and evaluations of upkeep paintings to make certain excessive requirements are met.

Invest in Modern Maintenance Tools and Training

Finding: Adequacy of maintenance experts.

Recommendation: Invest in current upkeep gear and generation to grow efficiency. Provide ongoing schooling for the protection workforce to keep them updated with trendy preservation strategies and first-rate practices.

Recommendations Based on Rebound Hammer Test Results

Detailed Investigation for Low Strength Areas: Conduct further checks (eg, middle sampling, ultrasonic pulse velocity) on locations with low rebound numbers to verify the compressive electricity and check the integrity of the concrete

Structural Analysis and Assessment: Engage a structural engineer to study the findings, mainly for regions with low and mild electricity, to decide if reinforcement or other remedial measures are wished

Maintenance and Repair: Implement important upkeep or reinforcements in regions with lower strength to ensure structural protection and toughness Techniques may also encompass using epoxy injection, external bonding, or including assist columns/beams

Quality Control for Future Constructions: Enhance nice manipulate measures at some stage in construction to make certain steady concrete great This includes higher mixing, proper curing, and regular energy trying out

Regular Monitoring and Testing: Establish an agenda for ordinary monitoring and non-destructive trying out to ensure ongoing structural integrity and to locate any potential degradation over time

Specific Recommendations for LR Classrooms

Address Locations with Low Strength: Sites with rebound numbers around 2000 (eg, website thirteen) want a precise investigation and in all likelihood, reinforcement to prevent capacity structural problems

Reinforce Moderately Strong Areas: Locations with rebound numbers between 2400 and 2650 (eg, sites 5, 9) need to be monitored and considered for reinforcement to improve ordinary structural reliability

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Maintain and Monitor Good Strength Areas: Regular tracking have to be performed for locations with better rebound numbers (eg, websites 7, 10, 11) to make certain they stay in the correct condition

Specific Recommendations for Boys' Hostel

Immediate Attention to Low Strength Columns: Locations with rebound numbers around 2000 (eg, websites three, and four) should be prioritized for further checking out and on-the-spot structural reinforcement if essential

Ensure Uniform Slab Quality: Conduct additional testing and ensure steady concrete satisfactory across all slab sections, specifically in areas with rebound numbers near 2200

Comprehensive Structural Review: A thorough overview using a structural engineer is advised to decide the adequacy of the existing structure and to plan for any essential enhancements

Specific Recommendations for Girls' Hostel

Address Variability in Concrete Quality: Investigate the reasons in the back of the massive variability in rebound numbers throughout columns, beams, and slabs, in particular, that specializes in sites with low rebound numbers (eg, columns at 1800)

Strengthen Weak Areas: Implement reinforcement strategies for areas with lower rebound numbers to bring them as much as excellent electricity levels

Maintain Higher Strength Areas: Regular protection and monitoring of excessive-energy regions (eg, beams with rebound numbers around 3250) to ensure they remain structurally sound

Further Recommendations

Training and Quality Assurance: Provide schooling for construction employees on the right concrete mixing, curing, and testing methods to ensure great production practices

Document and Standardize Procedures: Develop and record trendy running processes for concrete quality warranty and normal trying out to maintain excessive creation standards

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Environmental Considerations: Consider environmental factors consisting of temperature and humidity at some point in concrete curing and testing, as these can extensively affect concrete power and durability.

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