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# Adequacy of electrical and electronic protective and safety devices in faculties of Ebonyi State University, Abakaliki

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**Abstract**
This study determined the adequacy of electrical and electronics protective and safety devices in faculties of Ebonyi State University. Specifically, the study explored the adequacy of power distribution and switching devices, adequacy of surveillance and monitoring devices, adequacy of fire/smoke detective devices and adequacy of power backup devices in faculties of Ebonyi State University. Four research questions guided the study. The study adopted the descriptive survey design and the target population of the study was twenty (20) faculty buildings from four university main campuses situated at CAS, PRESCO, Ishieke and Permanent Campuses, there was no sampling. A validated Electrical and Electronics Protective and Safety Device Assessment Checklist of approved Edition of International Electrical Engineers (IEEE STD 3007) Electrical Power Distribution for Buildings was used for data collection. Data was analyzed using frequencies and percentages while Chi-square Goodness-Fit was used to test the null hypotheses. Findings indicated inadequacy of electrical and electronics protective and safety devices in the faculties of Ebonyi State University. This reveals that the existing electrical safety infrastructure is not sufficient to guarantee optimal safety and protection of lives, equipment, and buildings as well as learning facilities which may expose the university environment to increased risks of electrical faults, fire disasters, equipment damage, and operational disruptions that can negatively affect academic productivity. The study therefore recommends that university management should conduct comprehensive electrical safety audits across all faculties to assess the availability, functionality, and compliance level of protective and safety devices.

**Keywords:** Adequacy, electrical, electronics, protective and safety devices

## Introduction

Safety is a concept that is concerned with achieving a positive state of well-being among people within social and physical environments. Safety is a fundamental requirement in any environment where electrical and electronic equipment are installed and used. Electrical and electronic systems, while essential for everyday use also pose potential hazards such as electric shock, fire outbreaks, equipment damage, and other accidents when adequate protective and safety measures are not in place. The presence and proper functioning of electrical and electronic protective and safety devices are therefore crucial in preventing these risks and ensuring the protection of lives and properties.

With the increasing complexity of university operations including the use of advanced electrical and electronics systems in laboratories, workshops, libraries, and digital technologies, the need for comprehensive safety frameworks has become more urgent (U.S. Fire Administration, 2021) [8]. Therefore, ensuring safety in academic environment involves both technical measures such as the use of power distribution and switching devices, surveillance and monitoring devices, fire/smoke detective devices, power back-up devices, as well as administrative actions including safety training, signage, and regular inspections. Institutions that fail to prioritize safety may face increased risks of fire outbreaks, electrical accidents, equipment damage, and even loss of lives (Ukim, 2021) [22]. In this context, safety is not just a compliance requirement but a strategic necessity for academic success, operational continuity, and the protection of institutional assets which can be achieved through the use of electrical and electronics devices for protection and safety.

Protection refers to the measures, devices, or actions taken to prevent damage, injury, or loss by controlling or eliminating potential hazards. Protection in electrical systems is "the use of relays and circuit-interrupting devices to detect abnormal conditions and isolate faulty sections in order to safeguard equipment and ensure continuity of supply." In addition, International Electro technical Commission (IEC, 2017) [14] defines protection as the application of systems and devices designed to detect faults and automatically initiate corrective actions to minimize risk and prevent damage. It involves taking proactive measures to prevent or mitigate risks and ensure the well-being and security of individuals and infrastructures. Protection within university environment refers to the strategic implementation of systems, devices, and policies aimed at safeguarding lives, infrastructure, equipment, and data against various risks particularly those arising from electrical and electronics, environmental, and human-related hazards. In modern university settings where the use of electrical and electronics devices is extensive across lecture halls, laboratories, libraries and faculty administrative blocks generally, the need for effective protective measures is critical because it plays a vital role in minimizing disruptions, preventing accidents, and ensuring administrative resilience. Therefore, protection in university institutions must be approached as both a technical and administrative responsibility to ensure the safety of individuals and infrastructures and this can be achieved

through the use of electrical and electronics protective and safety devices.

Electrical devices are machines or gadgets that utilize electrical energy to perform specific tasks by converting it into other forms of energy. Electrical devices, also known as electrical appliances are gadgets that utilize electrical energy to perform specific tasks. These devices convert electrical energy into other forms of energy to accomplish their intended functions. They play a crucial role in various aspects of our daily lives (Davis, 2018) [5]. Electronic device according to Gregorio (2022) [9], means an item that operates by controlling the flow of electrons or other electrically charged particles in circuits for the purpose of information processing and system control using electronics components such as resistors, inductors, capacitors, diodes, switches, transistors and integrated circuits. Electronics are designed to improve convenience, safety, and productivity in various sectors, including institutions, healthcare, communication, transportation, and residential environments. Electrical and electronics protective and safety devices play a critical role in ensuring the reliability, safety, and functionality of electrical systems social environments. These devices are designed to prevent electrical hazards such as shocks, fire outbreaks, equipment damage, and system failures by monitoring and controlling irregularities in voltage, current, and environmental conditions. Electrical and electronics protective and safety devices are essential components of any electrical installation, especially in modern buildings, industries, and institutional environments. Their primary role is to detect, prevent, and mitigate electrical hazards such as over current, overvoltage, ground faults, short circuits, electric shocks, and fire outbreaks. These devices are not just protective mechanisms, they are critical for the safe operation, maintenance, and longevity of electrical systems and electronics equipment (Williams, 2019) [6]. According to U.S. Department of Housing and Urban Development (2021) [21], the effectiveness of such systems is measured not only by their presence but also by their proper installation, maintenance, adequacy and utilization.

Protective and safety devices such as power distribution and switching devices, fire/smoke protective devices, surveillance and monitoring devices as well as power backup devices have become indispensable in educational institutions. However, despite technological advancement, many institutions still face challenges related to the adequacy, awareness, and regular maintenance of these devices. In line with this, Ukim (2021) [22] emphasized that institutional safety is heavily dependent on adequacy and consistent evaluation of safety infrastructures and staff/student compliance with safety standards. The adequacy of electrical and electronics protective and safety devices refers to the extent to which these devices are available, functional, appropriately installed, and capable of providing the expected level of protection against electrical faults, hazards, and failures. These devices, which include power distribution and switching devices, fire/smoke protective devices, surveillance and monitoring devices and power backup devices are essential in minimizing risks to lives, equipment and buildings in institutional environments (Williams, 2019). An adequate protective system is not measured merely by the presence of devices but by their effectiveness in responding to abnormal electrical conditions such as over current, short circuits, overvoltage, ground faults, and electrical surges. According to Okezie and Ogbuagu (2020) [16], many buildings in developing countries suffer from poorly maintained or outdated protective electrical installations, making them vulnerable to fire outbreaks and equipment damage. In educational institutions, for example, where electrical equipment is in constant use, inadequate protection can lead to significant disruption and safety concerns. Ukim (2021) [22] emphasized that the level of safety in built environments depends largely on continuous assessment, upgrading of protective systems, and proper risk management strategies. Institutions that prioritize these factors often experience fewer electrical accidents and enjoy a more reliable power infrastructure. As noted by Adewuyi and Okafor (2020) [2], electrical and electronics safety is a shared responsibility that combines engineering control, administrative action, and individual awareness. Therefore, the adequacy of protective devices should be viewed as an integral part of a broader safety culture that aims to safeguard human lives and institutional assets.

The adequacy of electrical and electronics protective and safety devices in a university setting is a critical aspect of institutional safety and infrastructure reliability. In a rapidly expanding institution like Ebonyi State University (EBSU), where a range of academic and administrative activities depend heavily on electricity and electronic systems the need for adequate, functional, well-installed, and maintained protective devices cannot be overemphasized. Adequate deployment of these devices ensures that the university faculty's critical areas such as libraries, laboratories, lecture theatres, offices, and auditoriums are protected from electrical hazards that could lead to property damage and injury. According to Adewuyi and Okafor (2020) [2], an adequate protective system is measured not just by its availability, but also by its functionality, proper installation, accessibility, and compliance with safety standards. In Ebonyi State University, while there is evidence of electrical safety devices across several faculties and departments, the adequacy of these devices varies. For instance, some buildings are equipped with modern fire alarm systems and surge protectors, while others rely on outdated or insufficient protective infrastructures. Okezie and Ogbuagu (2020) [16] argue that one of the major issues facing Nigerian public institutions is the inconsistency in the installation and maintenance of protective devices. This inconsistency often results from limited funding, poor safety culture, and lack of periodic audits.

In EBSU, the experience of frequent power surges, which not only disrupt academic activities but also pose risks to sensitive equipment such as projectors, computers, laboratory and workshop devices. Moreover, the adequacy of protective systems in EBSU is also influenced by the level of safety awareness among staff and students. Ukim (2021) [22] emphasized the role of human behavior in ensuring institutional safety, suggesting that even the best-installed systems can fail if users are not trained to respond to alarms or observe safety practices. Therefore, protection in EBSU must be viewed as a holistic framework that includes adequate device installation, regular maintenance, and safety education. Electrical and electronic protective and safety devices are essential in safeguarding lives, institutional assets, and academic infrastructure from the dangers of electrical faults, fire outbreaks, power surges, and system failures. In the context of a growing tertiary

institution like Ebonyi State University (EBSU), the adequacy of these protective measures is central to uninterrupted academic operations, data protection, and physical safety and according to Williams (2019), electrical safety systems such as surge arresters, fire alarms, and isolation/disconnect switches are designed to detect and mitigate electrical hazards before they escalate. However, the mere presence of these devices is not enough. Their adequacy also depends on proper distribution across university faculty facilities, and responsiveness to real-time hazards.

In recent years, Nigerian universities have witnessed recurring fire incidents that have raised concerns about the adequacy of electrical and electronic protective and safety devices within higher institutions. Many of these fire outbreaks have been linked to electrical faults, poor wirings, overloading of circuits and the absence of protective and safety devices such as surge protectors, isolators, functional fire alarms etc. Recent cases to illustrate this include a fire incident at the University of Ibadan, Queen Elizabeth II hall which was gutted by fire in December 2024[20], with eyewitness reports attributing the outbreak to an electrical fault (Punch, 2024) [20]; Similarly, in December 2023, the Senate building of Ahmadu Bello University, Zaria, was engulfed by fire reportedly linked to a poorly labeled electrical distribution board (Daily Trust, 2023) [4] and University of Jos also experienced a major fire in 2016 that razed its faculty building and library complex, disrupting examinations and causing loss of resources (Vanguard, 2016) illustrate both the frequency and severe academic/operational consequences of campus fires. Within Ebonyi State University itself, past accounts of fire scares associated with absence and inadequacies of protective and safety devices highlight the institution's vulnerability and the urgency for context-specific evaluation (Nwankwo, 2022) [19]. Also, devices like computers, servers, laboratory instruments, digital projectors, and communication systems are highly sensitive to electrical disturbances such as voltage fluctuations, power surges, overloads, and lightning strikes. Without adequate electrical and electronic protective and safety devices, these disturbances can easily damage equipment and lead to the loss of valuable data.

Despite the growing dependence of universities on electrical and electronic systems for teaching, research, and administration, there is limited empirical research that specifically evaluates the adequacy of electrical and electronic protective and safety devices within faculties of universities, particularly in Ebonyi State. Most existing studies do not provide detailed assessments of the types and distribution of protective devices in faculty buildings. Therefore, the gap this study intends to fill is the lack of comprehensive empirical evidence on the adequacy of electrical and electronics protective and safety devices in faculty buildings of Ebonyi State University. By systematically examining the presence, condition, and sufficiency of these devices, the study will provide data-driven insights that can guide university management in improving electrical safety standards, protecting lives and equipment, and ensuring a safer academic environment.

**Statement of the Problem**

Nigerian universities including Ebonyi State University, Abakaliki, operate in an environment where increasing demand for electricity and electronic devices is not matched with commensurate investment in electrical and electronic protective and safety infrastructure. Many higher institutions, particularly in developing countries, experience inadequate provision of devices due to poor maintenance practices, aging installations, lack of safety awareness, and lack of fund to procure devices. In recent years, Nigerian universities have witnessed recurring fire incidents that have raised concerns about the adequacy of electrical and electronic protective and safety devices within universities. According to the National Fire Protection Association, electrical faults and absence of electrical and electronic devices are among the major causes of building fires in institutional facilities. The lack of protective and safety devices may also expose users to the risk of electrocution, damage of valuable laboratory equipment, loss of data, disruption of academic activities, and significant financial losses to the institution.

Despite the importance of electrical safety in academic environments, there is often limited attention given to the adequacy of electrical and electronic protective and safety devices within institutions. In some cases, some existing devices may be obsolete, insufficient, or poorly maintained, thereby reducing their effectiveness in preventing electrical disasters. Therefore, the problem of this study is the uncertainty regarding the adequacy of electrical and electronic protective and safety devices in the faculties of Ebonyi State University. Without a proper assessment of these safety devices, the institution may remain vulnerable to electrical hazards that could endanger lives, damage property, and disrupt academic activities. This study therefore seeks to determine the adequacy of electrical and electronics protective and safety devices in the faculties of Ebonyi State University.

**Objectives of the Study**

The study determined:

1. The adequacy of power distribution and switching devices in faculties of Ebonyi State University.
2. The adequacy of surveillance and monitoring devices in faculties of Ebonyi State University.

**Research Questions**

The following research questions guided the study:

1. How adequate are the power distribution and switching devices in faculties of Ebonyi State University?
2. How adequate are the surveillance and monitoring devices in faculties of Ebonyi State University?

**Hypotheses**

The following hypotheses were tested at 0.5 level of significance.

**$H0_1$:** The adequacy of power distribution and switching devices in faculties of Ebonyi State University did not deviate significantly from the approved standard number of devices.

**$H0_2$:** The adequacy of surveillance and monitoring devices in faculties of Ebonyi State University did not deviate significantly from the approved standard number of devices.

**Methodology**

The study adopted the descriptive survey research design. A descriptive survey design was appropriate because the study seeks to collect detailed information about existing

conditions of electrical and electronic safety devices without manipulating any variables. The population of this study is twenty (20) faculty buildings from the four university main campuses situated at CAS, Ishieke, Presco and Permanent Site. These faculty buildings comprised of all rooms and halls in the major university campuses which include129 lecture halls, 652 offices, 35 laboratories and workshops, 13 auditoriums and 27 libraries. The researcher did not draw a sample from the population. Instead, all the faculty buildings that constituted the population were studied in their entirety, the researcher found it feasible and more accurate to investigate all units within the population. This eliminated the need for sampling and ensured that all relevant data were captured. The validated Electrical and Electronic Protective and Safety Device Assessment Checklist (EEPSDAC). The EEPSDAC checklist was designed to obtain relevant Information on the adequacy of electrical and electronic protective and safety devices installed in the various buildings of Ebonyi State University faculties covered by the study. The completed checklists were sorted, coded, and summarized using percentages. The total number of buildings and number of devices were used to determine the percentage of adequacy of electrical and electronic protective and safety devices. In the sense that percentages close to 100% and above indicate adequacy and compliance with IEE safety standards while percentages below 50% indicates inadequate provision of electrical and electronic protective devices. The chi-square of independence was employed to test the hypotheses at a 0.05 level of significance.

## Results

### Research Questions

**Table 1:** Percentage analysis of adequacy of power distribution and switching devices in faculties of Ebonyi State University

| Items | No. of Buildings | No. of Expected Devices | No. of Observed Devices | % of Availability | Decision |
|---|---|---|---|---|---|
| 1.MainDistribution Board (MDBs) | 20 | 20 | 17 | 85% | Inadequate |
| 2.Sub-distribution boards (SDBs) | 20 | 120 – 160 | 90 | 64% | Inadequate |
| 3.Busbar Chambers with Insulation | 20 | 40 | 23 | 58% | Inadequate |
| 4.Isolation/Disconnect Switches | 20 | 200 | 106 | 53% | Inadequate |
| 5.Automatic Transfer Switch (ATS)/ Manual Changeover Switch | 20 | 40 | 32 | 80% | Inadequate |
| 6.Lightning Arresters/ Surge Arresters | 20 | 40sets | 19sets | 48% | Inadequate |
| 7.Emergency Power-Off (EPO) | 20 | 140 | 35 | 25% | Inadequate |
| 8.Surge Protection Device (SPD) Type1 | 20 | 20 | 17 | 85% | Inadequate |
| 9.Surge Protection Device (SPD) Type 2 | 20 | 160 | 128 | 80% | Inadequate |
| 10.Earth Continuity Conductors | 20 | 20 | 15 | 75% | Inadequate |

**Source:** Researcher's field work (2026)

Table 1 revealed that power distribution and switching devices such as main distribution boards ranked 85%, sub-distribution boards 64%, bus bar chambers with insulation 58%, isolation/disconnect switches 53%, automatic transfer switches 80%,lightening arresters 48%, emergency power off 25%, surge protection devices 1and11 85% and 80%respectively and earth continuity devices 75%with item 7 at 25% ranking the least showed that power distribution and switching devices in faculties of Ebonyi State University were inadequate

**Table 2:** Percentage analysis of adequacy of surveillance and monitoring devices in faculties of Ebonyi State University

| Items | No. of Buildings | No. of Expected Devices | No. of Observed Devices | % of Availability | Decision |
|---|---|---|---|---|---|
| 11.CCTV Cameras (Closed-Circuit Television) | 20 | 320 – 480 | 4 | 2% | Inadequate |
| 12.IP Cameras (Internet Protocol) | 20 | 320 – 480 | 0 | 0% | Nil |
| 13.Motion Detectors/ Sensors | 20 | 240 – 400 | 0 | 0% | Nil |
| 14.Access Control Systems (e.g.,RFID or Card Readers) | 20 | 120 – 240 | 0 | 0% | Nil |
| 15.Biometric Scanner (Fingerprint, Face,Iris) | 20 | 80 – 160 | 0 | 0% | Nil |
| 16.Burglar Alarm Systems | 20 | 20 | 0 | 0% | Nil |
| 17.Network Monitoring Systems | 20 | 20 | 3 | 15% | Inadequate |
| 18.Dashcams/Bodycams | 20 | 80 – 160 | 0 | 0% | Nil |
| 19.Audio Surveillance Devices (Microphones, Recorders) | 20 | 40 – 80 | 0 | 0% | Nil |
| 20.Security Control Panels | 20 | 20 | 10 | 50% | Inadequate |

**Source:** Researcher's field work (2026).

Table 2 revealed that surveillance and monitoring devices like the closed-circuit television ranked 2%, internet protocol cameras 0%, motion detectors/sensors 0%, access control devices 0%, biometric scanners 0%, burglar alarm systems 0%. Network monitoring systems15%, dash cams/body cams 0%, audio surveillance devices 0% and security control panels 50%showedthat surveillance and monitoring devices in faculties of Ebonyi State University were grossly inadequate.

**Table 5:** Chi-square result of the adequacy of power distribution and switching devices in faculties of Ebonyi State University compared to the approved standard number of devices

| Items | O | E | (O – E) | $(O – E)^2$ | | $X^2$.Cal. | df | $X^2$.Crit. | Decision |
|---|---|---|---|---|---|---|---|---|---|
| 1. Main distribution boards (MDBs) | 17 | 20 | -3 | 9 | 0.45 | 169.20 | 9 | 16.92 | Reject H0 |
| 2. Sub-distribution boards (SDBs) | 90 | 140 | -50 | 2500 | 17.86 | | | | |
| 3. Busbar Chambers with Insulation | 23 | 40 | 17 | 289 | 7.23 | | | | |
| 4. Isolation / Disconnect Switches | 106 | 200 | -94 | 8836 | 44.18 | | | | |
| 5. Automatic Transfer Switch (ATS)/ Manual Changeover Switch | 32 | 40 | -8 | 64 | 1.60 | | | | |
| 6. Lightning Arresters / Surge Arresters | 19 | 40 | -21 | 441 | 11.03 | | | | |
| 7. Emergency Power-Off (EPO) | 35 | 140 | -105 | 11025 | 78.75 | | | | |
| 8. Surge Protection Device (SPD) Type 1 | 17 | 20 | -3 | 9 | 0.45 | | | | |
| 9. Surge Protection Device (SPD) Type 2 | 128 | 160 | -32 | 1024 | 6.40 | | | | |
| 10. Earth Continuity Conductors | 15 | 20 | -5 | 25 | 1.25 | | | | |

**Source:** Researcher's field work (2026).

The result in Table 5 indicated that $X^{2.}$ Cal. value of 169.20 was higher than $X^2$Crit. Value of 16.92at0.05 level of significance and degrees of freedom9 revealed that power distribution and switching devices in faculties of Ebonyi State University significantly deviated from the approved standard number of devices. Therefore, the null hypothesis which stated that adequacy of power distribution and switching devices in faculties of Ebonyi State University did not deviate significantly from the approved standard number of devices was rejected.

**$H0_2$:** The adequacy of surveillance and monitoring devices in faculties of Ebonyi State University did not deviate significantly from the approved standard number of devices.

**Table 6:** Chi-square result of the adequacy of surveillance and monitoring devices in faculties of Ebonyi State University compared to the approved standard number of devices

| Items | *O* | *E* | *(O – E)* | *$(O – E)^2$* | | *$X^2$.Cal.* | *df* | *$X^2$.Crit.* | *Decision* |
|---|---|---|---|---|---|---|---|---|---|
| 11.CCTV Cameras (Closed-Circuit Television) | 1 | 400 | -399 | 159201 | 398.00 | 1637.45 | 9 | 16.92 | Reject H0 |
| 12.IP Cameras (Internet Protocol) | 0 | 400 | -400 | 160000 | 400.00 | | | | |
| 13.Motion Detectors/Sensors | 0 | 320 | -320 | 102400 | 320.00 | | | | |
| 14.Access Control Systems (e.g., RFID or Card Readers) | 0 | 180 | -180 | 32400 | 180.00 | | | | |
| 15.Biometric Scanners (Fingerprint,Face,Iris) | 0 | 120 | -120 | 14400 | 120.00 | | | | |
| 16.Burglar Alarm Systems | 0 | 20 | -20 | 400 | 20.00 | | | | |
| 17.Network Monitoring Systems | 3 | 20 | -17 | 289 | 14.45 | | | | |
| 18.Dashcams / Bodycams | 0 | 120 | -120 | 14400 | 120.00 | | | | |
| 19.Audio Surveillance Devices (Microphones, Recorders) | 0 | 60 | -60 | 3600 | 60.00 | | | | |
| 20.Security Control Panels | 10 | 20 | -10 | 100 | 5.00 | | | | |

**Source:** Researcher's field work (2026)

The result in Table 6 indicated that $X^{2.}$ Cal. value of 1637.45 was higher than $X^2$Crit. Value of 16.92at 0.05 level of significance and degrees of freedom 9 revealed that surveillance and monitoring devices significantly deviated from the approved standard number of devices. Therefore, the null hypothesis which stated that adequacy of surveillance and monitoring devices in faculties of Ebonyi State University did not deviate significantly from the approved standard number of devices was rejected.

**Discussions**

The finding that power distribution and switching devices in the faculties of Ebonyi State University are inadequate indicates that the existing electrical infrastructure falls short of meeting the minimum requirements for safe, reliable, and efficient electricity utilization within an academic environment. Power distribution and switching devices such as main and sub-distribution boards, isolators, changeover switches, and automatic transfer switches are critical for effective load management, system protection, and operational continuity (Gupta, 2018[10]; IEEE, 2020). The observed inadequacy suggests that many faculty buildings may be operating with undersized, obsolete, poorly coordinated, or insufficiently installed devices, thereby limiting their capacity to handle present electrical loads. According to Chapman (2017) [3], inadequately designed distribution systems often result in frequent overloading, voltage drops, and unplanned outages, conditions that adversely affect sensitive equipment commonly used in laboratories and workshops. In the context of Ebonyi State University, such conditions may disrupt teaching and learning activities and compromise research productivity. From a safety standpoint, inadequate power distribution and switching devices significantly elevate the risk of electrical accidents, including electric shock, insulation failure, equipment damage, and fire outbreaks. Studies by Hughes (2016) and Ekundayo and Akinlabi (2019) [6, 11] emphasize that the absence or insufficiency of properly rated surge devices and isolators undermines fault clearance and safe isolation during emergency situations. This condition exposes both users and maintenance personnel to avoidable hazards and contravenes internationally accepted electrical safety principles. Furthermore, the inadequacy reflects a departure from recommended standards and best practices, including those prescribed by the IEEE, IEC, and Nigerian Electricity Supply and Installation Standards (NESIS). The IEEE (2020) [1] stresses that institutional buildings require well-structured distribution hierarchies with adequate switching and protective coordination to ensure system reliability and personnel safety. The deviation observed in the faculties of Ebonyi State University may be attributed to aging infrastructure, incremental building expansion without corresponding electrical upgrades, limited funding, and weak enforcement of electrical installation standards

(Okorie & Eze, 2021) [17]. These findings imply that the current state of power distribution and switching devices in the faculties of Ebonyi State University is safety-wise inadequate, necessitating urgent intervention. Comprehensive upgrading, proper sizing of devices, adherence to applicable standards, and periodic electrical safety audits are essential to enhance system reliability, safeguard lives and property, and support sustainable academic and research operations within the university environment.

The gross inadequacy of surveillance and monitoring devices in the faculties of Ebonyi State University suggests a significant shortfall in the systems designed to observe, control, and ensure the safety, security, and operational oversight of electrical infrastructure and associated hazards. Surveillance and monitoring devices such as closed-circuit television, internet protocol, motion detectors, access control systems, network monitoring systems and audio surveillance devices play a vital role in detecting anomalies, preventing system failures, and facilitating timely maintenance interventions (Adeoye & Johnson, 2020; Olalere, 2018) [1, 18]. Inadequate surveillance and monitoring equipment implies that the faculties may lack real-time visibility of system performance, making it difficult to detect issues like surveillance, intrusion or abnormal temperature rises before they escalate into critical failures or safety hazards. Additionally, the absence of these devices undermines both safety and operational efficiency. Tema and Nyarko (2021) [8] highlight that facilities lacking adequate monitoring technologies are more vulnerable to theft and other system interferences. In the university context, this could translate to greater downtime, reduced reliability, and increased procurement costs thereby negatively impacting academic and research activities. From a standards perspective, international frameworks like IEEE and IEC emphasize the need for appropriately specified monitoring and control systems as part of a comprehensive electrical safety strategy (IEEE, 2020) [1]. The inadequacy observed in the faculties of EBSU indicates a deviation from these best practices, which may arise due to factors such as limited budgetary allocations for infrastructure, insufficient technical planning, or outdated electrical installations (Okorie & Eze, 2021) [17]. Overall, the inadequacy of surveillance and monitoring devices at EBSU points to a systemic weakness in electrical oversight and safety preparedness. Addressing this gap would require targeted investments in modern monitoring technologies, regular system assessments, and alignment with recognized standards to enhance the reliability, safety, and sustainability of the university's electrical systems.

**Conclusion**

Based on the findings indicating inadequacy of electrical and electronics protective and safety devices in the faculties of Ebonyi State University, it can be concluded that the existing electrical safety infrastructure is not sufficient to guarantee optimal protection of lives, equipment, and buildings as well as learning materials. The inadequacy of critical devices such as power distribution and switching devices, surveillance and monitoring devices, exposes the university environment to increased risks of electrical faults, fire outbreaks, equipment damage, and operational disruptions. The situation suggests gaps in installation standards, maintenance practices, system capacity planning, and safety compliance. In an academic environment where electrical systems support teaching, research, laboratory experiments, and digital learning infrastructure, inadequate protection systems can negatively affect academic productivity, increase operational costs, and compromise institutional safety. Therefore, there is a strong need for comprehensive electrical safety upgrades, regular inspection and maintenance programs, proper device selection and installation, and strict adherence to relevant electrical safety standards and regulations. Addressing these deficiencies will improve system reliability, enhance safety culture, protect institutional assets, and support sustainable academic and research activities within Ebonyi State University.

**Recommendations**

1. The university management should conduct comprehensive electrical safety audits across all faculties to assess the availability, functionality, and compliance level of protective and safety devices. This will help identify faulty, obsolete, or missing devices and guide replacement and upgrade plans.
2. There should be systematic upgrading and standardization of electrical and electronics protective devices such as power distribution and switching devices, surveillance and monitoring devices in line with recognized national and international electrical safety standards.
3. The university should establish structured preventive maintenance schedules for all electrical installations and protective devices. Regular testing, servicing, and calibration will ensure continuous functionality and reduce unexpected system failures.
4. Management should invest in adequate backup power systems (such as generators, UPS systems, and renewable energy backup solutions) integrated with protective devices to ensure continuity of power supply and protection of sensitive equipment during outages.
5. Regular training programs should be organized for technical staff, laboratory personnel, and facility managers on electrical safety practices, operation of protective devices, emergency response procedures, and hazard identification.
6. The university should develop and enforce strict electrical safety policies, including mandatory compliance checks during installation, renovation, and expansion of faculty buildings. Regulatory compliance monitoring units should be established to ensure adherence to electrical safety standards.
7. University management should develop and implement a formal electrical safety policy that mandates minimum requirements for installation, operation, inspection, and maintenance of electrical protective and safety devices across all faculties. The policy should align with national electrical regulations and international safety standards and be enforced through periodic compliance reviews.
8. Management should establish a dedicated Electrical Safety and Compliance Unit under the Works and Maintenance Department. This unit should be responsible for conducting routine inspections, maintaining safety records, coordinating electrical safety audits, and ensuring that all faculties comply with approved electrical safety standards.

9. The university should institutionalize compulsory electrical safety audits (e.g., annually or bi-annually) for all faculty buildings. Audit findings should be tied directly to budget planning, renovation approvals, and infrastructure upgrade decisions to ensure that identified safety gaps are promptly addressed.

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