

Electrical Energy & Safety Audit Report of Mangaldoi Commerce College, Mangaldoi, Assam



Audit Period: 31/03/2022-04/04/2022

Audited by: MRINMOY BORUAH ENGINEERING

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ACKNOWLEDGEMENT

We sincerely thank Mr. Pankaj Kumar Saha, Principal, Mangaldoi Commerce College, as well as Dr. Hemanta Chakrabarty, Head, IQC, and Mr. Sabibur Rahman, Lecturer, for their facilitation and support in conducting the data collection and measurement for this Electrical Energy & Safety audit conducted on 31/03/2022.

Electricity utilisation in the college campus is primarily for classroom activities and management. Overall electricity utilisation is optimal. However, some weaknesses were observed in the electrical power distribution system. Suggestions for needful rectification/revamping of all these defects were verbally briefed to the college administration during the visit. Detailed observations and suggestion for improvement are elaborated in this report.

We trust that the findings of this Electrical Energy & Safety Audit and the suggestions provided in this formal audit report will be helpful for safe and optimal use of electricity and upkeep of the electrical power distribution system and installations in the Mangaldoi Commerce College.

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FOREWORD

This audit was carried out as per the verbal work order received from the Principal, Mangaldoi Commerce College for the Electrical Energy & Safety Audit of Mangaldoi Commerce College, Mangaldoi, Assam.

The broad scope of this audit was to evaluate the energy usage efficiency and safety status of the Power distribution system of the Mangaldoi Commerce College campus. The audit was carried out in the presence of electrical support staff of the College.

As part of the audit work (physical observation, testing and necessary data collection) a physical inspection visit was made to the college campus on 31/03/2022.

Review of electricity bills and physical observations reveal that electricity utilisation in the college campus is optimal. However some safety weakness/discrepancies were observed in the electricity distribution system of the college during the data collection part of the audit work. These were briefed and highlighted to all those present during the audit. Some cleaning job at the substation were carried out immediately during the audit.

The audited installation (Mangaldoi Commerce College) will be considered fully safe after rectification of the discrepancies. Regular maintenance and upkeep are utmost essential for optimal and safe use of electricity.

Approach and methodology

The approach and methodology in carrying out the work were as follows:

Conducting of audit:

Conducting of audit and training of personnel was done by experienced Power quality and safety auditors. The audit team of four persons was headed by Mr. Mrinmoy Boruah, BEE certified Energy Auditor & Electrical Consultant, having wide experience of conducting such audit. The other assisting team members were also experienced and have been regularly assisting Mr. Boruah in energy audit related works. The names of the team members and their years of experiences are enlisted in the following table.

Sl. No.	Name	Qualification	Experience (years)
1.	Mr. Mrinmoy Boruah, B.E.(Electrical) & BEE certified Energy Auditor	Energy Auditor & Head of the audit team	10+years' experience in auditing
2.	Mr. Aditya Boruah B.Tech. (Electrical)	Associate Engineer	2+ years
3.	Mr. Hironmoy Baruah	Technical Assistant	10+ years
4.	Mr. Madan Prasad	Technical Assistant	10+ years

Instruments for conducting audit: The following instruments were deployed for on-site measurements

- a) 2 nos. of Three-phase Power Loggers along with analyzing software (Hioki 31000-94 and Fluke 1735)
- b) Single-phase clamp-on power meter (Meco)
- c) Digital Multimeter (Metravi)
- d) Thermal Camera (Seek CompactPro)
- e) IR temperature gun (Benetech GM550)
- f) Earth resistance tester
- g) Insulation tester
- h) Lux Meter

Data analysis: Data collected and monitored during the field work were analyzed and report on analysis are presented in subsequent pages.

Report preparation: Compilation of the Audit Report, highlighting scope for economizing electricity usage and suggesting ways to improve safety and regulatory compliances, if any. Photographs, diagrams, measured data and power-logs taken during the audit are to be included in the compiled report for reference and record.

EXECUTIVE SUMMARY

Observations and analysis of collected data reveal that electricity utilization at the Mangaldoi Commerce College campus is optimal. However, some safety weakness/discrepancies were observed in the power distribution arrangement.

A summary of rectification recommendations are presented below for needful corrective action. These defect rectification and revamping/improvement work are necessary to make electricity utilisation in the College campus optimal and safe.

- 1) An MCB switch of appropriate rating should be installed at the LT Grid supply input, in place of the existing 100A fuse. The fuse protection system currently being used is not sufficient to ensure safety of the power distribution system of the college.
- 2) A distribution board (DB) should be installed for power distribution to the various rooms of the college campus. This main distribution board should have MCB switches of appropriate rating for each of the circuits outgoing to the different rooms of the college.
- 3) The DBs installed at the various rooms of the college have isolators as their Main Incomer Switch. These isolators should be replaced by MCB switches of appropriate ratings.
- 4) A complete revamping of the earth arrangement is necessary.

New earth-pits should be constructed at easily accessible locations in the college campus. Concrete earth-pit protection chambers having a hinged CI cover should be constructed for these earth-pits.

Earthing connections should be provided for each of the switchboards and DBs at each room of the college campus. The earthing conductors should be neatly drawn to the earth-pit and securely fastened to the earth-pipe.

The earth-pits should be regularly watered to keep the earth resistance values at a minimum. A funnel should be installed for pouring water into these earth-pits.

**Audit observations
of
Electrical installations
and
Power Distribution System**

4.1 Electrical distribution topology

At present there is no Single Line Diagram of power distribution circuit available for verification. The existing power distribution circuits should be traced out and a single line diagram representation of the same should be prepared.

A mandatory approval of the final SLD is to be secured from the office of the Chief Electrical Inspector cum Advisor, Govt. of Assam. It is a safety rule/measure for enabling easy tracing of electric circuits in case of any trouble and for any necessary alteration in the power distribution arrangement.

Observations:

- The primary source of power supply to the college campus is from an Overhead LT Grid Supply cable.
- The LT grid supply cable is fed to a 100A Fuse, mounted on a wall at the corridor outside the Office room. There is no MCB/MCCB protection at the LT Grid supply input.
- From this fuse, 5 nos. of outgoing circuits are drawn out for power distribution to the various rooms of the college campus. There are 5 nos. of fuses (1 x 63A, 4 x 32A) installed for the protection of each of these outgoing circuits. These fuses are also mounted on a wall in the corridor. There is no Distribution Board installed for the power distribution to these circuits.
- Multiple tapplings are taken from these outgoing circuits to provide power supply to the different rooms. There are distribution boxes (DBs) installed at the different rooms for their power distribution. The Main incomer switch of each of these DBs are isolators. These isolators do not provide any protection for these circuits.



Photo: 100A Fuse at grid supply incomer

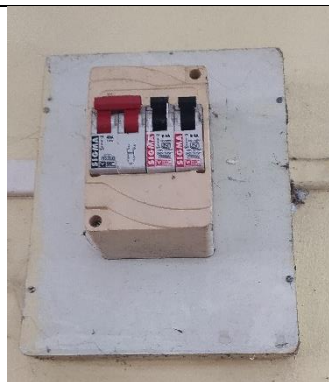


Photo: DB at Room #9:
1 x 40A DP Isolator (Main Incomer)
2 x 6A SP MCBs (Outgoing)

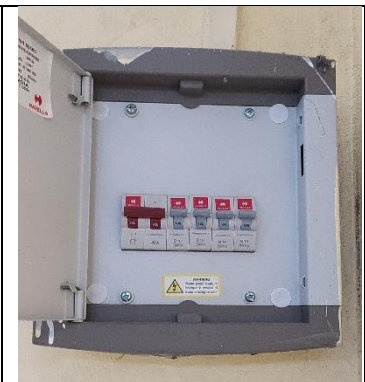


Photo: DB at Room #7:
1 x 40A DP Isolator (Main Incomer)
4 x 10A SP MCBs (Outgoing)

		
<p><u>Photo:</u> 40A DP Isolator at Computer Room (Main incomer)</p>	<p><u>Photo:</u> 2 x 20A SP MCBs at Computer room (Outgoing)</p>	<p><u>Photo:</u> DB#1 at Computer room (major): 1 x 40A DP Isolator (Main Incomer) 2 x 25A SP MCBs (Outgoing)</p>
		
<p><u>Photo:</u> DB#2 at Computer room (major): 3 x 10A SP MCBs; 3 x 6A SP MCBs (Outgoing)</p>	<p><u>Photo:</u> 40A DP Isolator at Room #2</p>	<p><u>Photo:</u> 16A Fuse Switch at Staff Room</p>
		
<p><u>Photo:</u> DB at Office Room: 1 x 40A DP Isolator (Main Incomer) 2 x 25A and 2 x 6A SP MCBs (Outgoing)</p>	<p><u>Photo:</u> 10A SP MCB for photocopier at Office Room</p>	<p><u>Photo:</u> 10A SP MCB at Office Room</p>

4.2 Study/findings on Earthing System



Photo: Earthing strip connected to the earth-pit buried underground.

Observations:

- There is only one earth-pit installed for the entire college campus. This earth-pit is untraceable as it has been buried under concrete cover
- There is a Copper earthing strip drawn out from this earth-pit. The earth resistance value was checked at this copper strip and found to be **38 Ohm**. The earth resistance value of this earth-pit is extremely high.
- There are copper multistrand wires used as earthing conductors to provide earthing connection to the switchboards at few of the rooms of the college campus. These copper wires are not connected to the earthing strip.

Essentially there is no earthing connection for the entire college campus.

A complete revamping of the earthing arrangement is necessary.

4.3 Load survey

Name of load	Qty	Wattage (W)	Total Load (W)
LED Tubelight	26	20	520
CFL Bulb	32	18	576
Incandescent Bulb	10	60	600
TV (42 inch)	2	120	240
LED Projector	1	150	150
Sub-woofer speaker	1	150	150
Photocopier	1	1500	1500
Printer	2	50	100
Water filter	1	25	25
DVR for CCTV Cameras	1	40	40
Total connected load=			3.901 KW

Table: List of connected loads

4.4 Analysis of electricity bill records

The electricity bill records for the past 11 months (April 2021 – February 2022) have been tabulated below:

Month	Billing period		No. Of days billed for	Maximum Demand (KVA)	Contract Demand (KVA)	MD/CD	PF
Apr'21	01-04-2021	30-04-2021	30	3.53	3.53	100%	0.85
May'21	01-05-2021	31-05-2021	31	3.53	3.53	100%	0.85
Jun'21	01-06-2021	30-06-2021	30	3.53	3.53	100%	0.85
Jul'21	01-07-2021	31-07-2021	31	3.53	3.53	100%	0.85
Aug'21	01-08-2021	31-08-2021	31	3.53	3.53	100%	0.85
Sep'21	01-09-2021	30-09-2021	30	3.53	3.53	100%	0.85
Oct'21	01-10-2021	31-10-2021	31	3.53	3.53	100%	0.85
Nov'21	01-11-2021	30-11-2021	30	3.53	3.53	100%	0.85
Dec'21	01-12-2021	31-12-2021	31	3.53	3.53	100%	0.85
Jan'22	01-01-2022	31-01-2022	31	3.53	3.53	100%	0.85
Feb'22	01-02-2022	28-02-2022	28	3.53	3.53	100%	0.85

Table: Electricity bill records of past 11 months

The Average MD recorded for the past 11 months was found to be **3.53KVA**

The Average PF recorded for the past 11 months was found to be **0.85**.

The energy utilization at the Mangaldoi Commerce College campus can be considered to be optimal.

CONCLUSION

The overall energy utilization at the Mangaldoi Commerce College campus was found to be optimal.

However, some safety weakness/discrepancies were observed in the power distribution arrangement.

A summary of recommendations is enlisted at the “Executive Summary” section of this report. Suggestions for the needful rectification works were stressed upon all concerned for ensuring safety of the power distribution system.

The power distribution system of the Mangaldoi Commerce College campus will be considered completely safe for its continued operation after completion of rectification of each of the observed discrepancies and carrying out of modification works as suggested by us.

--END OF REPORT--