



**Energy Audit Report of
Bhiwapur Mahavidyalaya, Bhiwapur
Dist. Nagpur, Maharashtra
Year 2020-21**



**ENERGY AUDIT REPORT
CONSULTATION REPORT**



Bhiwapur Mahavidyalaya

**Bhimadevi Temple Road, Near Telephone Exchange Office,
At Post Taluka: BHIWAPUR
Dist: Nagpur (M.S.) India- 441201**

PREPARED BY

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(2020-21)

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ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore takes this opportunity to appreciate & thank the management **Bhiwapur Mahavidyalaya, Bhiwapur Dist. Nagpur, Maharashtra.** for giving us an opportunity to conduct Energy audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

Rajesh Kumar Singadiya

(Director)

M.Tech (Energy Management), PhD (Research Scholar)
Accredited Energy Auditor [AEA-0284]
Certified Energy Auditor [CEA-7271]
(BEE, Ministry of Power, Govt. of India)
Empanelled Energy Auditor with MPUVN, Bhopal M.P.
Lead Auditor ISO50001:2011 [EnMS] from FICCI, Delhi
Certified Water Auditor (NPC, Govt of India)
Chartered Engineer [M-1699118], The Institution of Engineers (India)
Member of ISHRAE [58150]



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EXECUTIVE SUMMARY

The executive summary of the energy audit report furnished in this section briefly gives the identified energy conservation measures and other recommendation during the project that can be implemented in a phased manner to conserve energy, increase productivity inside the College campus.

ENERGY MANAGEMENT INITIATIVE TAKEN BY COLLEGE

✚ 04 KWp SOLAR PHOTOVOLTAIC ROOFTOP INSTALLATION:

College has 04 KWp solar photovoltaic roof top grid connected system installed college building. **Its Appreciable .**

AREA OF IMPROVEMENT

✚ LIGHTING SYSTEM

Replacement of “conventional T-12 (40 Watt) and T-8 (36 Watt)” tube light by energy efficient LED lighting fixture was taken up phased manner.

✚ TIMER CONTROLLED STREET LIGHTS

Installation of “Timer control on Focus Light and street lighting” in college campus is recommended.

✚ CEILING FAN AND EXHAUST FAN:

Replacement of “conventional ceiling fan (60 Watt)” by energy efficient star rated fan or BLDC based energy efficient fan (25 Watt) in “admin building, class rooms, and faculties cabin” have great potential for energy saving.

Replacement of “conventional exhaust fan (90 Watt to 125Watt)” by energy efficient star rated fan or BLDC based energy efficient Fan (20 to 40 Watt) in old building class rooms, faculties cabin have great potential for energy saving.

✚ IOT BASED ENERGY MONITORING SYSTEM AT MAIN FEEDER

- Installation of “Cloud based (IoT based) energy monitoring system” including harmonic measurement (total voltage and current harmonic distortion %) in power house will be good initiate for energy monitoring as well as student demo project for management. Expected energy saving potential about 2 to 4%.



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**CHAPTER-1
INTRODUCTION**

1.1 About College

Bhiwapur Mahavidyalaya stands as a synonym today for quality education as envisioned by its Founder, Heavenly Bhusaheb Govindrao Mulak in the mufassil area of Bhiwapur tehsil, Nagpur District. As on today, the Institution has blossomed into a full -grown tree catering to professional and conventional schooling to the rural masses.

At a time, when there were no educational institutions in the vicinity, a visionary Late Bahusaheb Govindraoji Mulak pioneered the noble cause of providing edification to the rural folks and under the tutelage of a Charitable Trust named Backward Class Youth Relief Committee in 1974, which initiated a beginning of new epoch in Higher Education in Vidarbha region of Maharashtra State. The stride of the Trust began by establishing Colleges all over with an Engineering College named KDK College of Engineering in 1981. The beacon of light of education dispersed throughout Vidarbha with seventeen institutions imparting learning in almost all the branches of Higher Education.

Bhiwapur Mahavidyalaya is located in Bhiwapur, a rural place with 137 small villages and is very close to the tribal dominated belt of forest area. Located in the serene natural environment with lush green forests and agriculture as the basic occupation, Bhiwapur a small flourishing town is 72 K.M. away from Nagpur. Bhiwapur Mahavidyalaya affiliated to Nagpur University, now Rashtrasant Tukadoji Maharaj Nagpur University was established in 1990 with Arts faculty with the sole objective of imparting education in the field of Higher Studies to enable the rural youth to learn locally and flourish globally despite the tribulations and dearth of abundance.

The journey of elevating the youth continued with the initiation of Commerce Faculty in 2002, B.Sc. in 2012 and B. Voc. in 2019. The stride and vision of the Founder strengthened in its conceptualization with the introduction of Post Graduate courses in Economics, Political Science and Sociology in 2004. Over the years, the noble vision manifested and carved a niche for itself and earned the recognition for the Institution as one of the premier co-educational Institutions in Nagpur region imparting quality education with the strong support of highly competent and skilled teaching and non-teaching staff.



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Keeping up with pace of the dynamic changes in the field of education, the Institution has kept itself abreast with ICT enabled classrooms, independent Departments; E.T.N.L software supported English Language Lab, state-of-the-art Computer Lab, fully automated Central Administrative Office and Central Library with spacious reading room and UGC Network Resource Centre. Today, the Institution is transforming its envisioned objectives into a reality through quality knowledge dissemination.

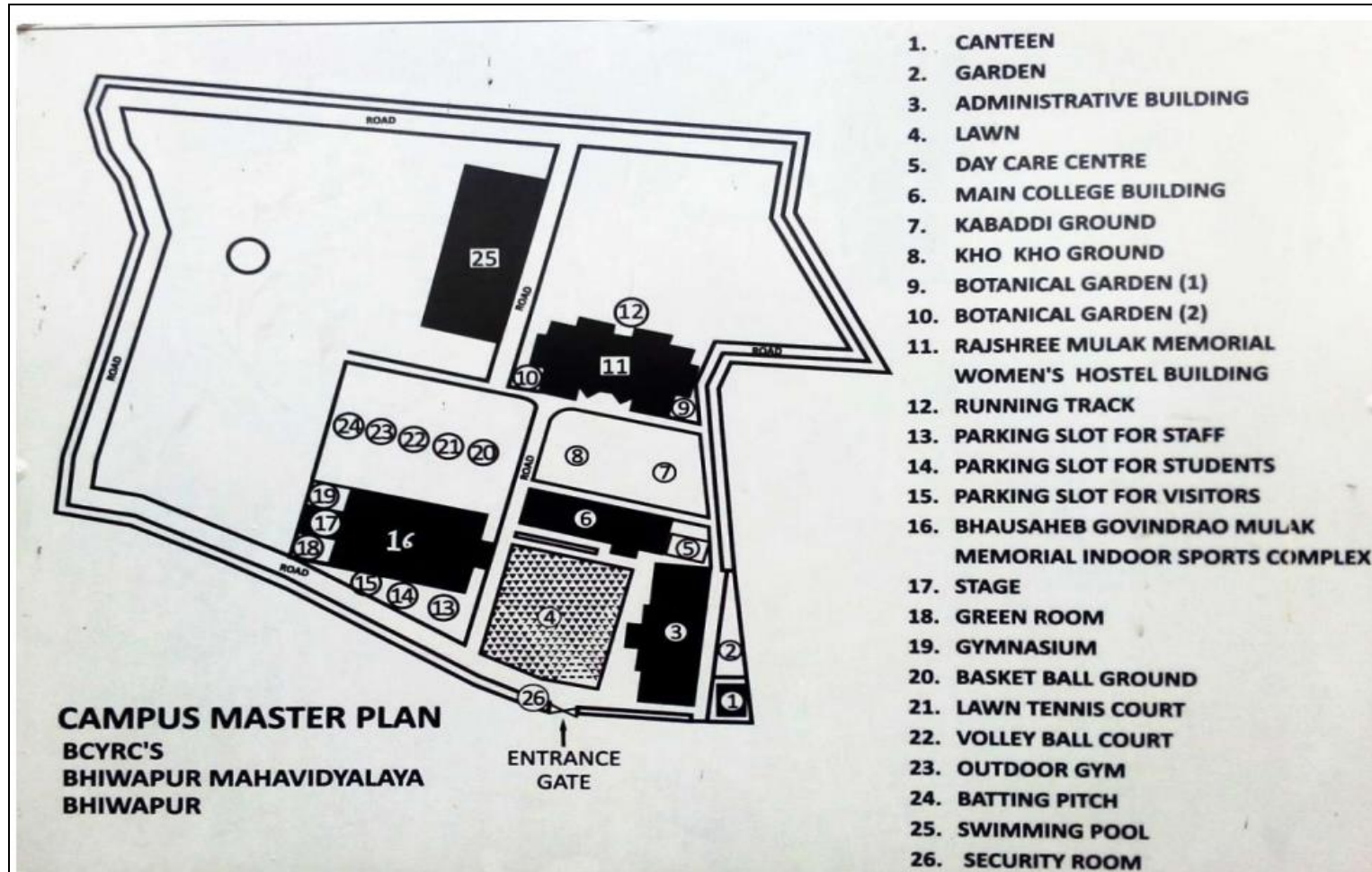
Over the years, the Institution has taken strides to fulfill its vision, mission and quality initiatives. It is proud moment in the history of the Institute to apprise all its stakeholders of the elevation and up gradation of its infrastructural facilities like multi-purpose Auditorium, Conference Hall, Common rooms for girls and boys, canteen, Gymnasium, playgrounds. The Institutions avowals the presence of International Level Swimming Pool and Indoor Stadium to strengthen the learners of the rural areas to compete unabashedly with zest in the world outside Bhiwapur. Gender equity and sensitization are an integral part of the institution's policy of empowering women's education. The Women's Hostel Building enables the girl students to accomplish their dreams of getting quality education. The Institution surpasses in rendering requisite facilities for the students to grow and live a dignified life



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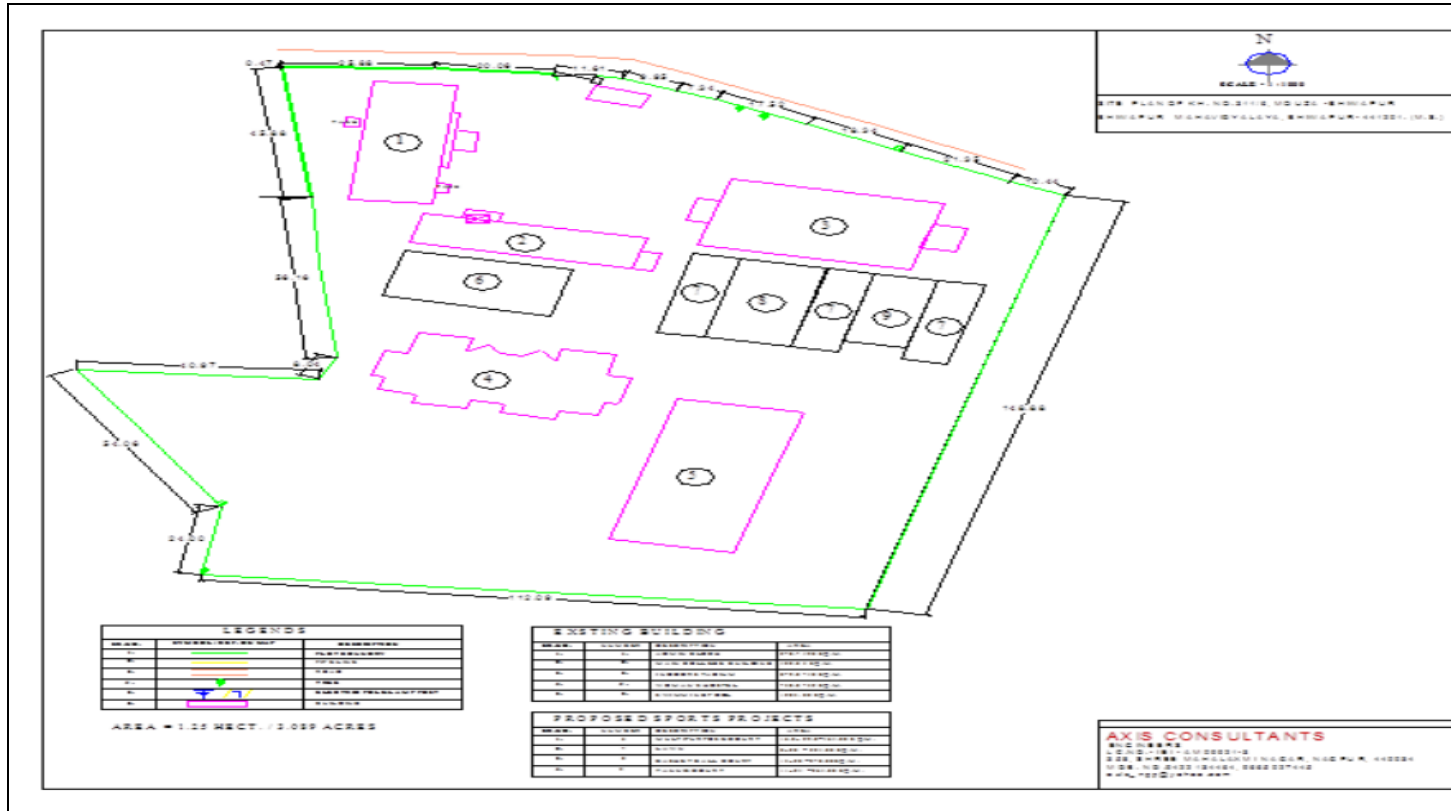


COLLEGE LAYOUT OF VARIOUS FLOORS





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1.2 Energy Monitoring Committee

Backward Class Youth Relief Committee's
BHIWAPUR MAHAVIDYALAYA
Arts, Commerce & Science Faculties (Junior and Senior)
At. Po. Bhiwapur, Distt. Nagpur (MS) -441201
Accredited with Grade B (CGPA-2.54) by NAAC, Bengaluru
Ph. No. 07106-232349 : Fax No. 07106-232064 Web site : www.bgm.ac.in
Email: bmv_bhiwapur@yahoo.com

<p>Dr. Jobi George M.A. (Eng.) M.Phil, Ph.D Principal</p>	<p>Smt. Sumanmala B. Mulak President B.C.Y.R.C. B.M.C.T. Khamla, Nagpur</p>	<p>Shri. Rajendra Mulak M.Com. L.L.B. Ex. Minister of State Finance & Planning, Water Resources, Excise, Energy & Parliamentary Affairs (M.S.) Secretary B.C.Y.R.C., B.M.C.T. Khamla, Nagpur</p>
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Ref. No./BMV/2021-22/EWGFA C/6649 Date 22/11/2021

ENERGY, WATER, GREEN AND ENVIRONMENT AUDIT COMMITTEE

Energy, Water, Green and Environment audit committee will consist of following members.

Sr. No.	Name of the Member	Designation	Department
01	Dr. Jobi George	Principal	Chairman
02	Dr. Mangesh V. Kadu	IQAC Co-ordinator	Political Science
03	Dr. Motiraj R. Chavhan	Asst. Professor	History
04	Shri. Somehwar Wasekar	Asst. Professor	English
05	Shri. Sagar M. Yadav	Jr. Lecturer	Botany
06	Shri. Sanjay Meshram	Sr. Clerk	Administrative Work
07	Shri. Gulab R. Gedekar	Peon	Gardener

PRINCIPAL
Bhiwapur Mahavidyalaya
Bhiwapur, Dist. Nagpur



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1. 3 Energy Audit Team

The study team constituted of the following senior technical executives from **Empirical Exergy Private Limited,**

- ✚ **Mr. Rakesh Pathak,** [Director & Electrical Expert]
- ✚ **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- ✚ **Mrs. Laxmi Raikwar Singadiya** [Energy & Chemical Engineer]
- ✚ **Mr. Sachin Kumawat** [Sr. Project Engineer]
- ✚ **Mr. Ajay Nahra** [Engineer]
- ✚ **Mr. Charchit Pathak** [Mechanical Engineer]
- ✚ **Mr. Aakash Kumawat** [Assistant Jr. Engineer]



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1.5 About Energy Audit

Energy audit helps to understand more about the ways energy is used in any plant and helps in identifying areas where waste may occur and scope for improvement exists. The overall energy efficiency from generation to final consumer becomes 50%. Hence one unit saved in the end user is equivalent to two units generated in the power plant.

Energy audit is the most efficient way to identify the strength and weakness of energy management practices and to find a way to solve problems. Energy audit is a professional approach in utilizing economic, financial, and social and natural resources responsibility. Energy audits “adds value” to management control and is a way of evaluating the system.

Empirical Exergy Private Limited (EEPL), Indore M.P. carried out the “Energy Audit” at the site to find gaps in the energy consumption pattern for Bhiwapur Mahavidyalaya, Bhiwapur Dist. Nagpur, Maharashtra. A technical report is prepared as per the need and the requirement of the project.

1.6 Objectives of Energy Auditing

An energy audit provides vital information base for overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures. It aims at:

- Identifying the quality and cost of various energy inputs.
- Assessing present pattern of energy consumption in different cost centers of operations.
- Relating energy inputs and production output.
- Identifying potential areas of thermal and electrical energy economy.
- Highlighting wastage in major areas.
- Fixing of energy saving potential targets for individual cost centers.
- Implementation of measures for energy conservation & realization of savings.



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1.7 Methodology:

Methodology adopted for achieving the desired objectives viz.: Assessment of the current operational status and energy savings include the following:

- ✚ Discussions with the concerned officials for identification of major areas of focus and other related systems.
- ✚ Team of engineers visited the site and had discussions with the concerned officials / supervisors to collect data / information on the operations and load distribution within the plant and same for the overall premises. The data was analyzed to arrive at a base line energy consumption pattern.
- ✚ Measurements and monitoring with the help of appropriate instruments including continuous and / or time-lapse recording, as appropriate and visual observations were made to identify the energy usage pattern and losses in the system.
- ✚ Trend analysis of costs and consumptions.
- ✚ Capacity and efficiency test of major utility equipment's, wherever applicable.
- ✚ Estimation of various losses
- ✚ Computation and **in-depth analysis** of the collected data, including utilization of computerized analysis and other techniques as appropriate were done to draw inferences and to evolve suitable energy conservation plan/s for improvements/reduction in specific energy consumption.



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CHAPTER- 2

POWER SUPPLY SYSTEM AND BILL ANALYSIS

2.1 Power Station and Bill analysis 2020-21

- ✚ Power Supply From: - MSEDCL
- ✚ Customer Number: - 414820011715
- ✚ Sectioned Load :- 0.7 KW
- ✚ Overall Unit Rs/Kwh Year-2020-21 = 7.45

Sr. No.	Month & Year	Section Load	Total Unit Consumption (kWh)	Amount Rs/-	Overall per unit charges (Rs/kWh)
1	Jul-20	0.7	941	5,601/-	5.95
2	Aug-20	0.7	1050	12,860/-	12.25
3	Sep-20	0.7	931	722/-	0.78
4	Oct-20	0.7	1137	8,540/-	7.51
5	Nov-20	0.7	1187	7,969/-	6.71
6	Dec-20	0.7	914	14,360/-	15.71
7	Jan-21	0.7	765	5,190/-	6.78
8	Feb-21	0.7	820	5,680/-	6.93
9	Mar-21	0.7	813	5,640/-	6.94
10	Apr-21	0.7	1047	7,135/-	6.81
11	May-21	0.7	1471	9,460/-	6.43
12	Jun-21	0.7	984	6,450/-	6.55
Total			12,060	89,607/-	7.45

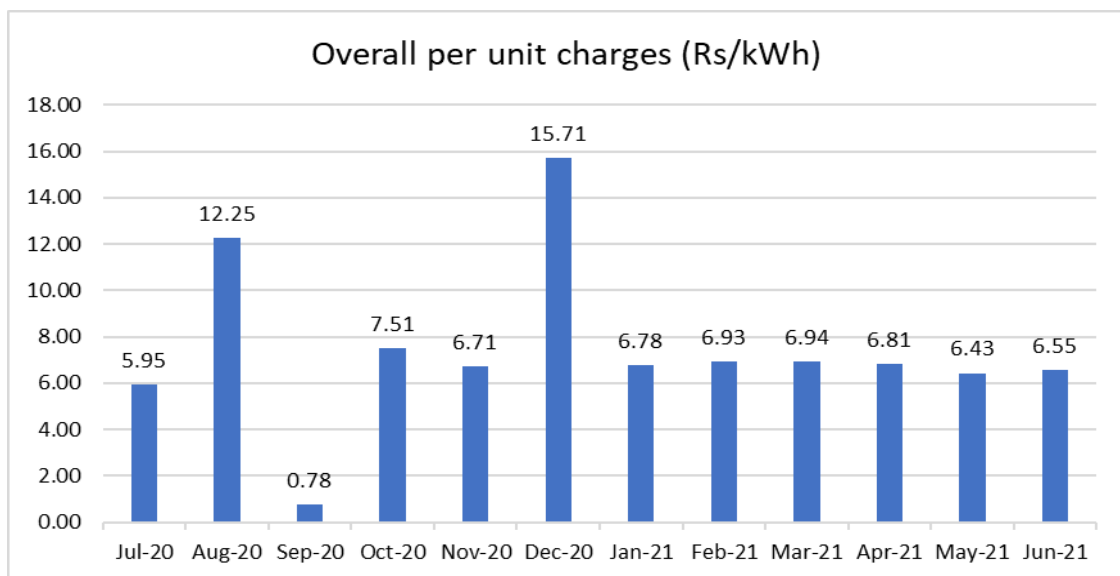




Figure 2.1 :- Graphical Presentation of Unit Consumption Year-2020-21

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2.2 DG Set :-

There is 1 DG set in power house . Detailed of the DG Sets are given below :



Sr. No.	Parameter	Technical Specification DG Set
1	Make	Kirloskar Brothers Ltd.
2	M/C No	NA
3	Capacity	25 KVA
4	Rated Voltage	240
5	Full load current	60
6	Frequency	50
7	Power factor	1.2
8	RPM	1500
9	Phase	Single



Figure 2.2 :- DG set in Power House

Observation & Suggestion:

- DG set use only in case of grid power failure.
- There is no system to monitor fuel consumptions w.r.t. unit generation.

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2.3 Photovoltaic System (4Kwp)

There is 4 KWp solar photovoltaic roof systems installed on college building System details are given below:

Sr. No	Description	Technical Specification
1	Plant Information	
1.1	Plant capacity	4.0KWp
1.2	Location	Bhiwapur Mahavidhyalaya Terris
1.3	Latitude & Longitude	20.764 & 79.51
2	PV Panel Details	
2.1	Make	Kotak Urja Pvt. Ltd.
2.2	Panel Type	Polycristline
2.3	Panel Wattage	17v
2.4	Panel Tilt Angle	25
2.5		
3	Inverter Information	
3.1	Make	Microtek
3.2	Model	UPS MEB 1400
3.3	Capacity of Inverter	4.8
3.4	No of Inverter	1



Figure 2.3 :- Solar Plant 4 KWp and Inverter System



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2.5 Connected Load of College:

Admin Building		
Sr.No.	Equipment	Quantity
1	Ceiling Fan	16
2	Wall Fan	9
3	LED Light	6
4	LED Light	25
5	LED Light	2
6	Bio Metric	1
7	Computer/laptop	17
8	Printer	5
9	T.V	3
10	Server Box	2
11	A.C	6
12	Micro Own	1
13	Xerox Machine	2
14	Stabilizer	1
15	Refrigerator	1



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Main Building		
Sr.No.	Equipment	Quantity
1	Ceiling Fan	65
2	Wall Fan	4
3	LED Light	72
4	Computer/laptop	58
5	Printer	2
6	Server Box	2
7	A.C	2
8	Micro Own	1
9	Xerox Machine	2
10	Stabilizer	2
11	Refrigerator	1
12	Bell	1
13	Exhausts Fan	5
14	R.O	1
15	Water Filter	2
16	Projector	6



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Indoor stadium		
Sr.No.	Equipment	Quantity
1	LED Light	1
2	LED Light	12
3	LED Light	1
4	Ceiling Fan	17
5	LED Light	15
6	Computer/laptop	2
7	Projector	1
8	Exhausts Fan	1

Hostel Building		
Sr.No.	Equipment	Quantity
1	Ceiling Fan	45
2	LED Light	38
3	Exhausts Fan	4



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Swimming Pool

Sr.No.	Equipment	Quantity
1	Ceiling Fan	1
2	LED Light	16
3	7.5 HP Motor	2
5	3 HP Motor	1
6	2 HP Motor	1

Canteen

Sr.No.	Equipment	Quantity
1	Ceiling Fan	3
2	LED Light	7
3	Refrigerator	1
4	Mixer Grinder	1

Street light ground

Sr.No.	Equipment	Quantity
1	LED Light	3
2	LED Light	2
3	LED Light	5



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2.6 Connected Load sharing equipment

Sr.no.	Equipment Name	Unit Watt	Quantity	Total Watt	Load %
1	Ceiling Fan	60	13	780	1.47
2	Wall Fan	60	13	780	1.47
3	LED Light	18	159	2862	5.40
4	LED Light	24	25	600	1.13
5	LED Light	50	2	100	0.19
6	Bio Metric	0.5	1	0.5	0.00
7	Computer	60	77	4620	8.71
8	Printer	120	7	840	1.58
9	T.V	250	3	750	1.41
10	Server Box	60	4	240	0.45
11	A.C	1500	8	12000	22.62
12	Micro Own	800	2	1600	3.02
13	Xerox Machine	500	4	2000	3.77
14	Stabilizer	120	3	360	0.68
15	Refrigerator	250	3	750	1.41
16	Bell	0.5	5	2.5	0.00
17	Exhausts Fan	250	7	1750	3.30
18	LED Light	100	15	1500	2.83
19	LED Light	50	3	150	0.28
20	Ceiling Fan	60	17	1020	1.92
21	Projector	120	1	120	0.23
22	7.5 HP Motor	7500	2	15000	28.28
23	3 HP Motor	3000	1	3000	5.66
24	2 HP Motor	2000	1	2000	3.77
25	Mixer Grunder	220	1	220	0.41
				53045	100



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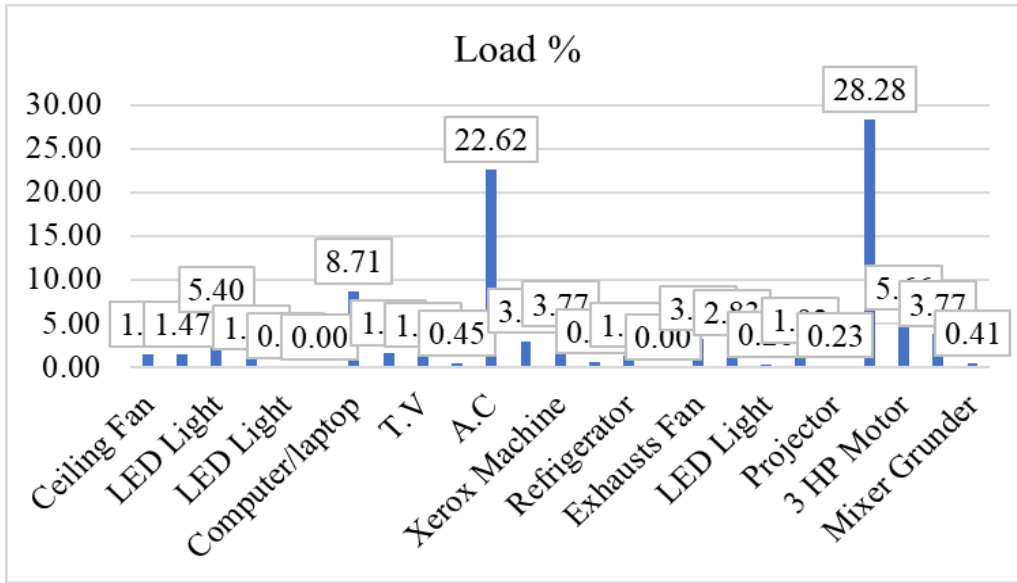


Figure :- Graphical Presentation of connected load Year-2020-21

2.6 Some Photograph of Electrical Equipment's: -



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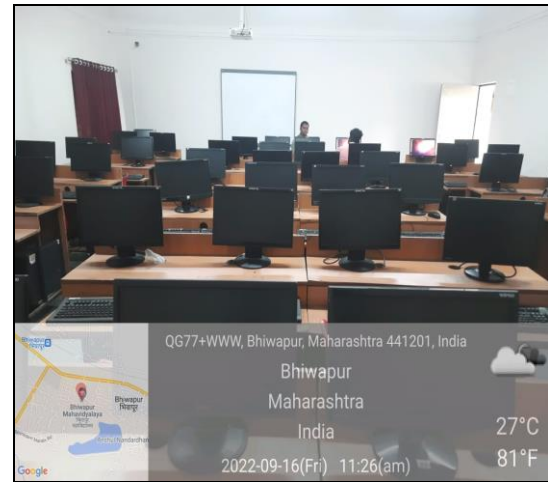


Figure 2.4 :- Electrical Equipment in College



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**END OF THE REPORT
THANKYOU**