

# ENERGY AUDIT REPORT

of  
Shiksha Mandal Wardha's  
**Shrikrishnadas Jajoo Grameen  
Seva Mahavidyalaya, Pipri  
Wardha**



Year: 2022-23

Prepared by:

**ENGRESS SERVICES**

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## ENGRESS SERVICES

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MEDA Registration No: ECN/2022-23/CR-43/1709  
ISO: 9001-2015 Certified (Cert No: 23EQKC13),  
ISO: 14001-2015 Certified (Cert No: 23EEKW20)

## ENERGY AUDIT CERTIFICATE

Certificate No: ES/SJGM/22-23/01

Date: 17/05/2023

This is to certify that we have conducted an Energy Audit at Shrikrishnadas Jajoo Grameen Seva Mahavidyalaya Pipri, Wardha, in the Year 2022-23.

The Institute has adopted following Energy Efficient practices:

- Usage of Energy Efficient LED Fittings
- Maximum usage of Day Lighting
- Installation of 2000 LPD Solar Thermal Water Heating System

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

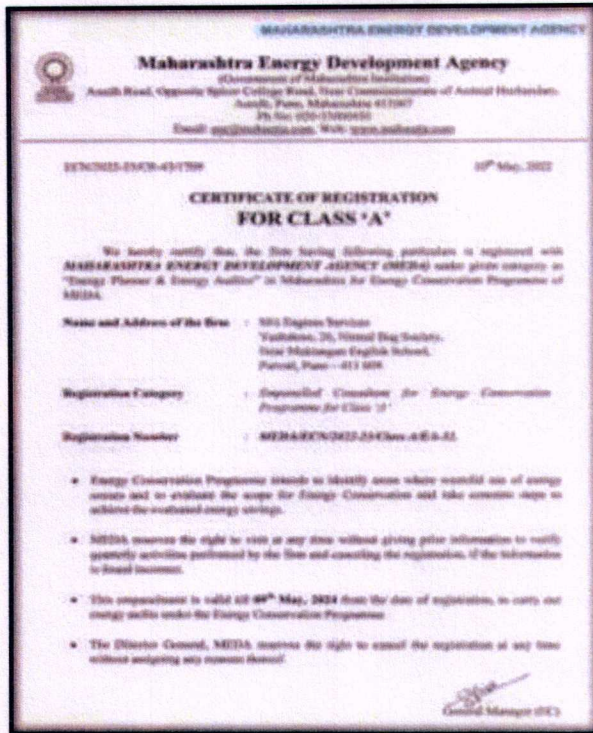
For Engress Services,



**A Y Mehendale,**  
B E-Mechanical, M Tech- Energy  
BEE Certified Energy Auditor, EA-8192



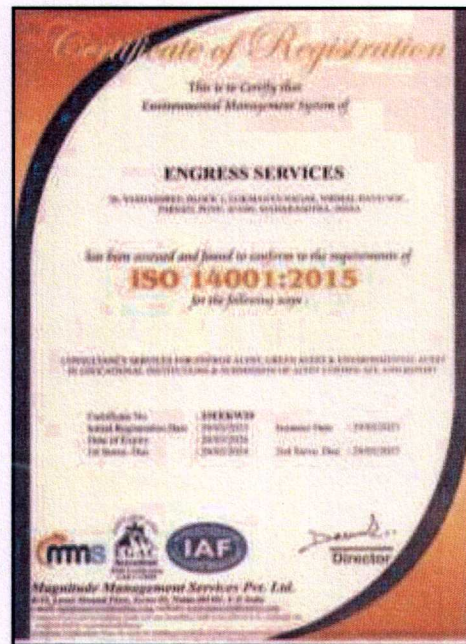
**Registration Certificates**



**MEDA Registration Certificate**



**ISO: 9001-2015 Certificate**



**ISO: 14001-2015 Certificate**



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## **ACKNOWLEDGEMENT**

We Engress Services, Pune, express our sincere gratitude to the management of Shrikrishnadas Jajoo Grameen Seva Mahavidyalaya Pipri, Wardha for awarding us the assignment of Energy Audit of their Campus for the Year: 2022-23.

We are thankful to all the staff members for helping us during the field study.



## EXECUTIVE SUMMARY

1. **Shrikrishnadas Jajoo Grameen Seva Mahavidyalaya Pipri, Wardha** consumes Energy in the form of **Electrical Energy**; used for various Electrical Equipment, office & other facilities.

### 2. Present Connected Load & Annual Energy Consumption:

No	Particulars	Value	Unit
1	Total Connected Load	44.33	kW
2	Annual Energy Consumption	12490	kWh
3	Annual CO <sub>2</sub> Emissions	11.24	MT

### 3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	12490	kWh
2	Total Built up area of Institute	3057.61	m <sup>2</sup>
3	Energy Performance Index =(1) / (2)	4.08	kWh/m <sup>2</sup>

### 4. Study of Lighting Power Density & % of LED Lighting:

No	Particulars	Value	Unit
1	Lighting Power density	0.84	W/m <sup>2</sup>
2	% of Usage of LED Lighting to Total Lighting Load	23.08	%

### 5. Renewable Energy & Energy Efficiency Projects:

- Usage of Energy Efficient LED Fittings
- Maximum usage of Day Lighting
- Installation of 2000 LPD Solar Thermal Water Heating System

### 6. Assumption:

- 1 kWh of Electrical Energy releases 0.9 Kg of CO<sub>2</sub> into atmosphere

### 7. References:

- Audit Methodology: [www.mahaurja.com](http://www.mahaurja.com)
- Energy Conservation Building Code: ECBC-2017: [www.beeindia.gov.in](http://www.beeindia.gov.in)
- For CO<sub>2</sub> Emissions: [www.tatapower.com](http://www.tatapower.com)

## **ABBREVIATIONS**

LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
BEE	:	Bureau of Energy Efficiency
ECBC	:	Energy Conservation Building Code
MEDA	:	Maharashtra Energy Development Agency
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO <sub>2</sub>	:	Carbon Di Oxide
MT	:	Metric Ton

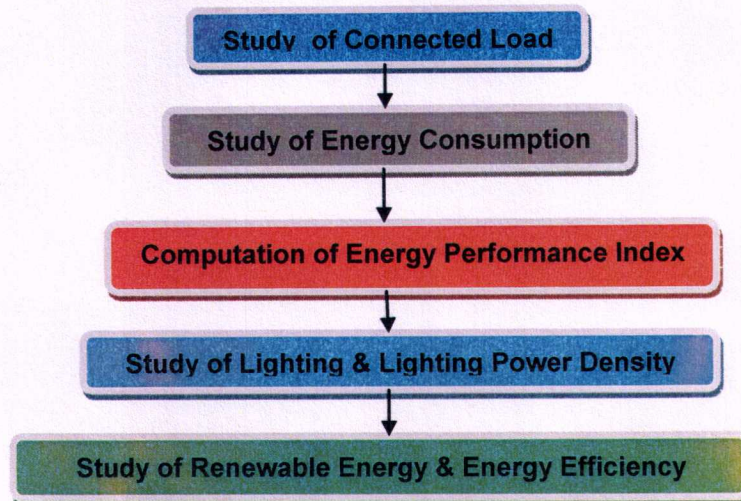
## CHAPTER-I INTRODUCTION

### 1.1 Introduction:

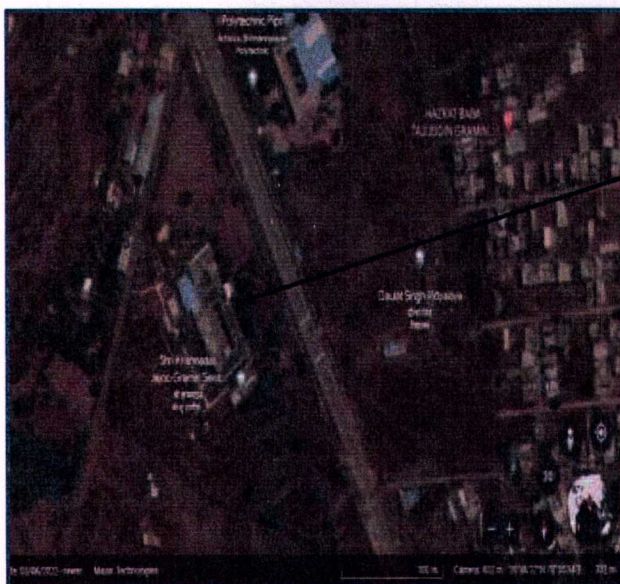
An Energy Audit is conducted at Shrikrishnadas Jajoo Grameen Seva Mahavidyalaya Pipri, Wardha. The guidelines followed for conducting the Energy Audit are:

- BEE India's Energy Conservation Building Code: ECBC-2017
- Maharashtra Energy Development Agency ([www.mahaurja.com](http://www.mahaurja.com))
- Tata Power: [www.tatapower.com](http://www.tatapower.com)

### 1.2 Audit Procedural Steps:



### 1.3 Institute Location Image:



Institute  
Campus



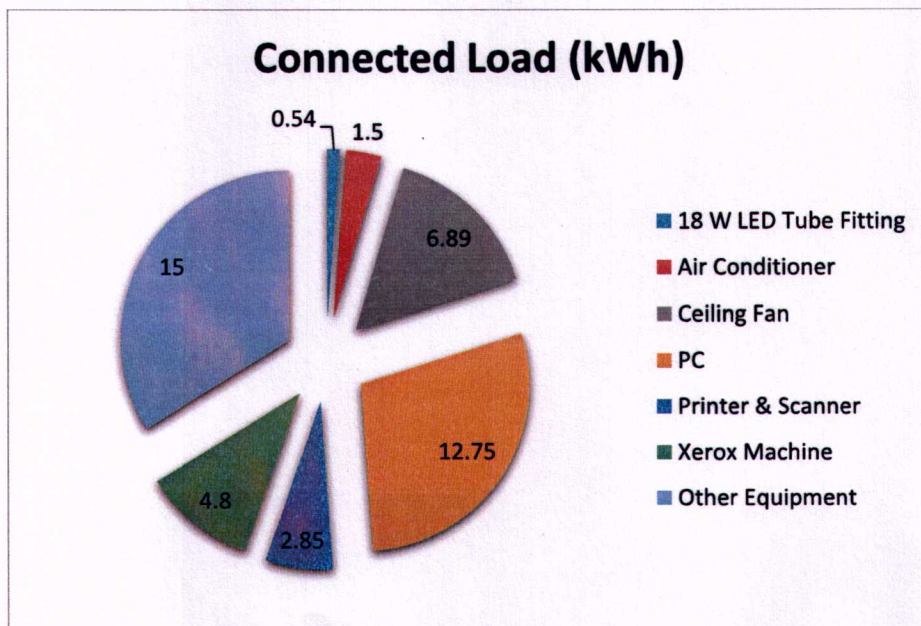
## CHAPTER-II STUDY OF CONNECTED LOAD

The major contributors to the connected load of the Institute include:

**Table No 1: Study of Equipment wise Connected Load:**

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL Fitting	45	40	1.8
2	18 W LED Tube Fitting	30	18	0.54
7	Air Conditioner	1	1500	1.5
8	Ceiling Fan	106	65	6.89
9	Computers	85	150	12.75
10	Printer & Scanner	19	150	2.85
11	Xerox Machine	4	1200	4.8
12	Other Equipment	100	150	15
13	<b>Total</b>			<b>44.33</b>

**Chart No 1: Study of Connected Load:**



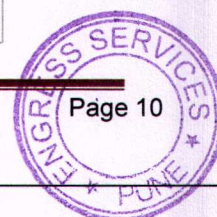
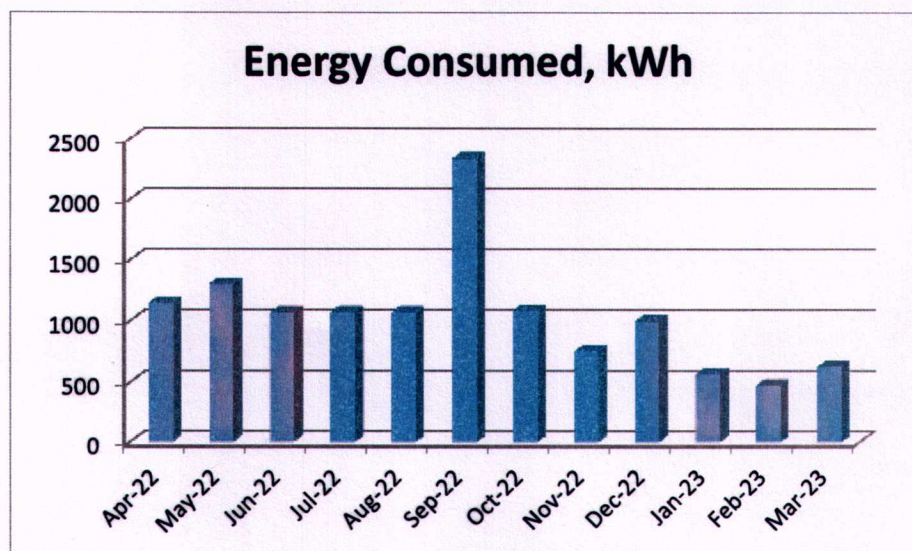
### CHAPTER-III STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of Electrical Energy Consumption.

**Table No 2: Electrical Bill Analysis- 2022-23:**

No	Month	Energy Consumption	CO <sub>2</sub> Emissions, MT
1	Apr-22	1141	1.026
2	May-22	1303	1.172
3	Jun-22	1071	0.963
4	Jul-22	1071	0.963
5	Aug-22	1071	0.963
6	Sep-22	2337	2.103
7	Oct-22	1082	0.973
8	Nov-22	750	0.675
9	Dec-22	995	0.895
10	Jan-23	565	0.508
11	Feb-23	478	0.430
12	Mar-23	626	0.563
13	Total	12490	11.24
14	Maximum	2337	2.103
15	Minimum	478	0.430
16	Average	1040.83	0.936

**Chart No 2: Variation in Monthly Energy Consumption:**



## **CHAPTER-IV**

### **STUDY OF ENERGY PERFORMANCE INDEX**

**Energy Performance Index:** Energy Performance Index of a Building is its Annual Energy Consumption in Kilo Watt Hours per square meter of the Building

It is determined by:

$$\text{EPI} = \frac{\text{Annual Energy Consumption in kWh}}{\text{Total Built-up area in m}^2}$$

Now we compute the EPI for the Institute as under:

**Table No 4: Computation of Energy Performance Index:**

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	12490	kWh
2	Total Built up area of Institute	3057.61	m <sup>2</sup>
3	Energy Performance Index =(1) / (2)	4.08	kWh/m <sup>2</sup>

## CHAPTER V STUDY OF LIGHTING

### Terminology:

1. **Lumen** is a unit of light flow or luminous flux. The lumen rating of a lamp is a measure of the total light output of the lamp. The most common measurement of light output (or luminous flux) is the lumen. Light sources are labeled with an output rating in lumens.

2. **Lux** is the metric unit of measure for illuminance of a surface. One lux is equal to one lumen per square meter.

3. **Circuit Watts** is the total power drawn by lamps and ballasts in a lighting circuit under assessment.

4. **Installed Load Efficacy** is the average maintained illuminance provided on a horizontal working plane per circuit watt with general lighting of an interior. Unit: lux per watt per square metre ( $\text{lux/W/m}^2$ )

5. **Lamp Circuit Efficacy** is the amount of light (lumens) emitted by a lamp for each watt of power consumed by the lamp circuit, i.e. including control gear losses. This is a more meaningful measure for those lamps that require control gear. Unit: lumens per circuit watt ( $\text{lm/W}$ )

6. **Installed Power Density**. The installed power density per 100 lux is the power needed per square metre of floor area to achieve 100 lux of average maintained illuminance on a horizontal working plane with general lighting of an interior

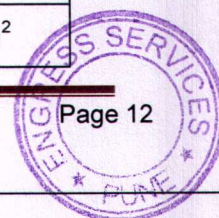
**Unit:** watts per square metre per 100 lux ( $\text{W/m}^2/100 \text{ lux}$ ) 100 Installed power density ( $\text{W/m}^2/100 \text{ lux}$ )

7. **Lighting Power Density:** It is defined as Total Lighting Load in a room divided by the Area of that Room in square meters.

In this Chapter we compute: Lighting Power Density of a Class Room. We also compute the percentage usage of LED Lighting to total Lighting Load of the Institute.

**Table No 5: Computation of Lighting Power Density:**

No	Particulars	Value	Unit
1	No of 18 W LED Tube Lights in Class Room	4	Nos
2	Demand of 18 W LED Tube Light	18	W/Unit
3	Total Lighting Load in the Class Room= (1) * (2)	72	W
4	Area of Class Room	85.57	$\text{m}^2$
5	Lighting Power Density = (3)/ (4)	0.84	$\text{W/m}^2$



Now, we compute the usage of LED Lighting to Total Lighting Load, as under.

**Table No 6: Percentage Usage of LED Lighting to Annual Lighting Load:**

No	Particulars	Value	Unit
1	Qty of 40 W FTL Light Fittings	45	Nos
2	Load per Fitting	40	W/Unit
3	Total Load of 40 W FTL Fitting	1.8	kW
4	Qty of 18 W LED Light Fittings	30	Nos
5	Load per Fitting	18	W/Unit
6	Total Load of 18 W LED Fitting	0.54	kW
7	Total Lighting Load=3+6	2.34	kW
8	Total LED Lighting Load=6	0.54	kW
9	% of Total Lighting Demand met by LED Lighting= $8*100/7$	23.08	%

## CHAPTER-VI

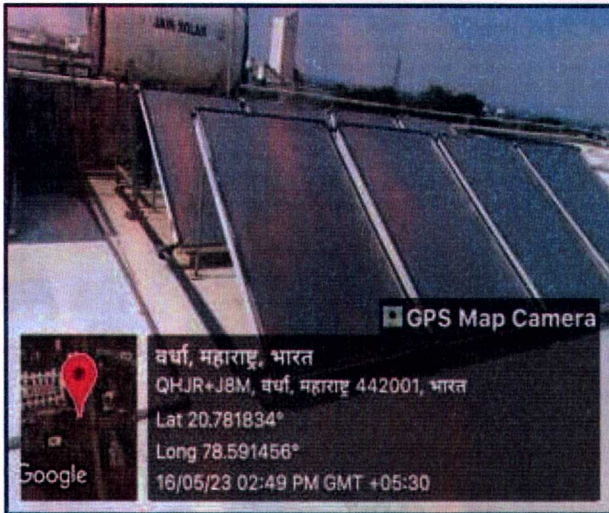
### STUDY OF RENEWABLE ENERGY & ENERGY EFFICIENCY

#### 6.1 Usage of Renewable Energy:

The Institute has installed Solar Thermal Water Heating System at the Hostel Blocks. It is recommended to install Roof Top Solar PV Plant. The details of Solar Thermal Water Heating Capacities are:

- On Girls Hostel Block: **2000 LPD**

#### Photograph of Roof Top Solar PV Plant & Solar Street Lighting System:



#### 6.2 Energy Efficiency Measures Adopted:

- The Institute has adopted Energy Efficient LED Lighting.
- Usage of Solar Based LED Street Lighting System in Campus and Hostel Premises.

