ENERGY AUDIT REPORT

of

RAJMATA JIJAU SHIKSHAN PRASARAK MANDAL'S, ARTS, COMMERCE & SCIENCE COLLEGE,

Landewadi, Bhosari, Pune 411 039

Year: 2022-23

Prepared by:

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: engress123@gmail.com

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: engress123@gmail.com

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/ RJSPMACSC /22-23/01 **Date: 10/7/2023**

This is to certify that we have conducted Energy Audit at Rajmata Jijau Shikshan Prasarak Mandal's Arts, Commerce & Science College, Landewadi, Bhosari in the Year 2022-23.

The College has adopted following Energy Efficient Practices:

- Usage of Energy Efficient LED Fittings
- Maximum usage of Day Lighting
- Installation of 10 kWp Capacity Roof Top Solar PV Plant

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

For Engress Services,

ENGRESS SERVICES PUNE

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

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411 009
Phone: 09890444795 Email:engress123@gmail.com

INVOICE

To **The Principal,** **R J S P M's,** **Arts, Science & Commerce College,** **Landewadi, Pune 411 039**	**Invoice No: 2023-24/137** **Date: 17/11/2023**

Work Order No	
Our PAN No	**AMOPM6853B**

No	Particulars	Charges per Unit, Rs.	Quantity Nos.	Amount in Rs.
1	Consultancy Service Charges for Energy Audit, Green Audit & Environmental Audit of your Campus	9000.00	Lot	9000.00
2	**Total Amount**			**9000.00**
3	**Amount in Words: Rupees Nine Thousand only.**			

For Engress Services,

Authorized Signatory

Bank Details:

Name of Account	Engress Services
Bank	SVC Co-Operative Bank Ltd
Branch	Sahakarnagar Branch, Pune
Current Account	112904180000319
IFSC Code	SVCB0000129

REGISTRATION CERTIFICATES

Regn. No. EA-8192 No. 2942

National Productivity Council
(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr. / Ms. Achyut Yashavant Mehendale son / daughter of Mr. Yashavant has passed the National Certification Examination for Energy Auditors in April - 2007, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India
Date : 10th August 2007

Controller of Examination

AUDITOR CERTIFICATE

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary, Aundh, Pune, Maharashtra 411067
Ph No: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2022-23/CR-43/1709 10th May, 2022

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with ***MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)*** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : M/s Engress Services
Yashshree, 26, Nirmal Bag Society,
Near Muktangan English School,
Parvati, Pune – 411 009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

Registration Number : *MEDA/ECN/2022-23/Class A/EA-32.*

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **09th May, 2024** from the date of registration, to carry out energy audits under the Energy Conservation Programme.
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (FC)

MEDA Registration Certificate

Certificate of Registration

This is to Certify that Quality Management System of

ENGRESS SERVICES

26, YASHASHREE, BLOCK 1, LOKMANYA NAGAR, NIRMAL BAUG SOC, PARVATI, PUNE- 411009, MAHARASHTRA, INDIA

has been assessed and found to conform to the requirements of
ISO 9001:2015
for the following scope :

CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT

Certificate No	23EQKC13		
Initial Registration Date	27/03/2023	Issuance Date	27/03/2023
Date of Expiry	26/03/2026		
1st Surve. Due	27/02/2024	2nd Surve. Due	27/02/2025

Director

Magnitude Management Services Pvt. Ltd.

ISO: 9001-2015 Certificate

Certificate of Registration

This is to Certify that Environmental Management System of

ENGRESS SERVICES

26, YASHASHREE, BLOCK 1, LOKMANYA NAGAR, NIRMAL BAUG SOC, PARVATI, PUNE- 411009, MAHARASHTRA, INDIA

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ISO 14001:2015
for the following scope :

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Certificate No	23EEKW20		
Initial Registration Date	29/03/2023	Issuance Date	29/03/2023
Date of Expiry	28/03/2026		
1st Surve. Due	29/02/2024	2nd Surve. Due	28/02/2025

Director

Magnitude Management Services Pvt. Ltd.

ISO: 14001-2015 Certificate

ENGRESS SERVICES PUNE

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ACKNOWLEDGEMENT

We at Engress Services, Pune, express our sincere gratitude to the management of Rajmata Jijau Shikshan Prasarak Mandal's Arts, Commerce & Science College, Landewadi, Bhosari, Pune for awarding us the assignment of Energy Audit of their Landewadi Campus for the Year: 2022-23.

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

EXECUTIVE SUMMARY

1. Rajmata Jijau Shikshan Prasarak Mandal's Arts, Commerce & Science College, Landewadi, Bhosari, Pune consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

2. Present Connected Load & Energy Consumption:

No	Particulars	Value	Unit
1	Total Connected Load	**66**	kW
2	Annual Energy Purchased	**19765**	kWh

3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Purchased	**19765**	kWh
2	Annual Energy Generated	**12000**	kWh
3	Annual Energy Consumed=1+2	**31765**	kWh
4	Total Built up area of College	**4181.43**	m^2
5	Energy Performance Index **=(3) / (4)**	**7.60**	kWh/m^2

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

No	Particulars	Value	Unit
1	Lighting Power Density	**0.97**	W/m^2
2	% of Usage of LED Lighting to Total Lighting Load	**94.12**	%

5. Renewable Energy & Energy Efficiency Projects:

- Usage of Energy Efficient LED fittings
- Installation of **10 kWp** Roof Top Solar PV Plant

6. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
2. Energy generated by Roof Top Solar PV Plant: **4 kWh/kWp per Day**
3. Annual Solar Energy generation Days: **300 Nos**

7. References:

- Audit Methodology: www.mahaurja.com
- Energy Conservation Building Code: ECBC-2017: www.beeindia.gov.in
- For CO_2 Emissions: www.tatapower.com
- For Solar PV Energy generation: www.solarrooftop.gov.in

ABBREVIATIONS

LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
BEE	:	Bureau of Energy Efficiency
ECBC	:	Energy Conservation Building Code
RSSPM	:	Rajmata Jijau Shikshan Prasarak Mandal
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO_2	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

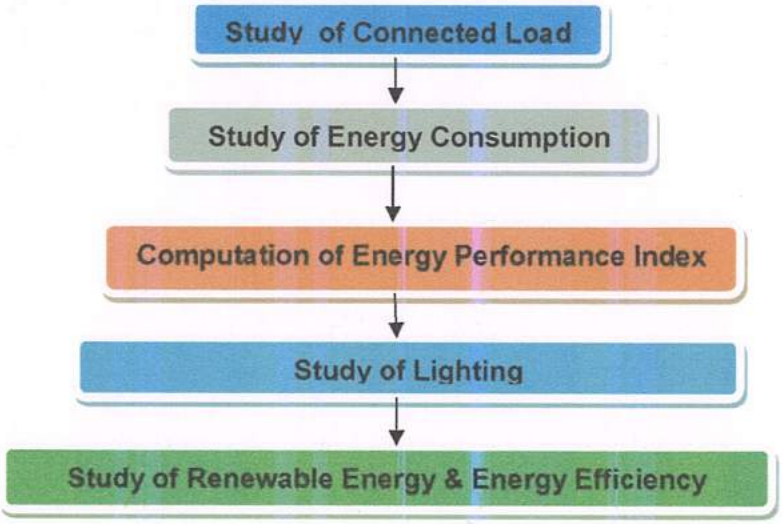
1.1 Introduction:

An Energy Audit is conducted at Rajmata Jijau Shikshan Prasarak Mandal's Arts, Commerce & Science College, Landewadi, Bhosari, Pune.

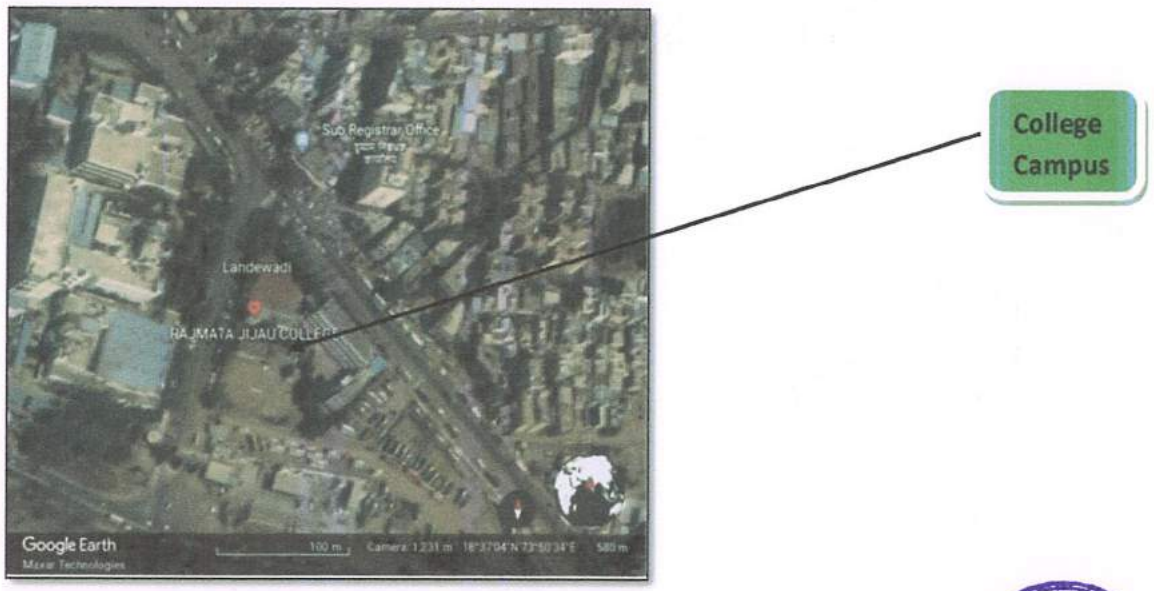
The guidelines followed for conducting the Energy Audit are:

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

1.2 Audit Procedural Steps:



1.3 College Location Image:



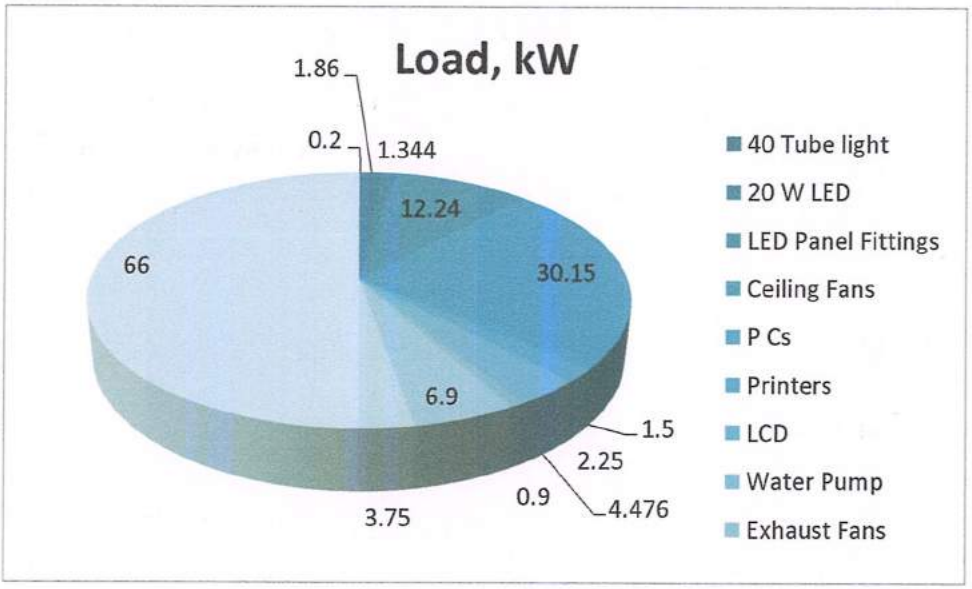
CHAPTER-II
STUDY OF CONNECTED LOAD

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

Table No 1: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 Tube light	5	40	0.2
2	20 W LED	93	20	1.86
3	LED Panel Fittings	84	16	1.344
4	Ceiling Fans	170	72	12.24
5	P Cs	201	150	30.15
6	Printers	10	150	1.5
7	LCD	15	150	2.25
8	Water Pump	2	2238	4.47
9	Exhaust Fans	6	150	0.9
10	A C	4	1725	6.9
11	Others	25	150	3.75
12	**Total**			**66**

Chart No 1: Study of Connected Load:



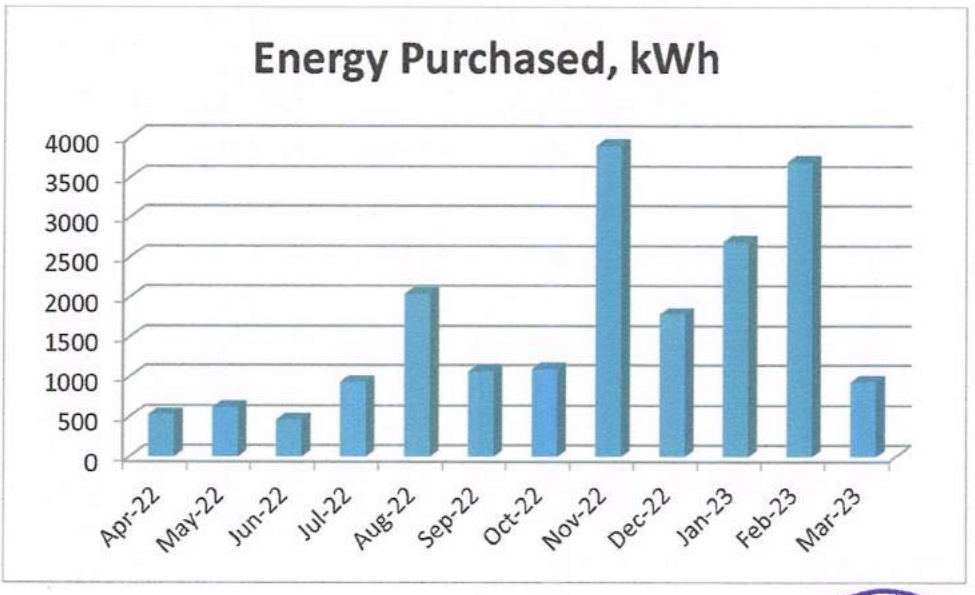
CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 2: Electrical Energy Purchase Analysis- 2022-23:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Apr-22	527	0.53
2	May-22	620	0.62
3	Jun-22	464	0.46
4	Jul-22	936	0.94
5	Aug-22	2044	2.04
6	Sep-22	1070	1.07
7	Oct-22	1094	1.09
8	Nov-22	3900	3.90
9	Dec-22	1787	1.79
10	Jan-23	2694	2.69
11	Feb-23	3694	3.69
12	Mar-23	935	0.94
13	Total	19765	19.77
14	Maximum	3900	3.90
15	Minimum	464	0.46
16	Average	1647.08	1.65

Chart No 2: Variation in Monthly Energy Purchased, kWh:



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:

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

Now we compute the EPI for the College as under:

Table No 3: Computation of Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Purchased	19765	kWh
2	Energy Generated by Solar PV Plant	12000	kWh
3	Total Energy Consumed= 1+2	31765	kWh
4	Total Built up area of College	4181.43	m^2
5	Energy Performance Index **=(3) / (4)**	**7.60**	kWh/m^2

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 (lux/W/m²)

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 (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 (W/m²/100 lux) 100 Installed power density (W/m²/100 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 the Lighting Power Density of Class Room and the percentage usage of LED Lighting to total Lighting Load of the College.
Now, we compute the usage of LED Lighting to Total Lighting Load, as under.
Table No 4: Computation of Lighting Power Density: Class Room: 1:

No	Particulars	Value	Unit
1	Qty of 20 W LED Fittings in Class Room: 1	3	Nos
2	Load of 20 W Fitting	20	W/unit
3	Total Load of 3 Nos, 20 W Fittings	**60**	W
4	Built up area of Class Room: 1	**62.13**	m^2
5	**Lighting Power Density = (3)/(4)**	**0.97**	W/m^2

Table No 5: Percentage Usage of LED Lighting to Total Lighting Load:

No	Particulars	Value	Unit
1	Qty of 40 W FTL Lights	5	Nos
2	Energy requirement of 40 W FTL Fitting	40	W
3	Demand of 169 Nos FTL Fittings	**0.2**	kW
4	Qty of 20 W LED Lights	93	Nos
5	Energy requirement of 20 W LED Fitting	20	W
6	Demand of 20 W LED Fittings	**1.86**	kW
7	Qty of 16 W LED Lights	84	Nos
8	Energy requirement of 16 W LED Fitting	16	W
9	Demand of 16 W LED Fittings	**1.344**	kW
10	Total Lighting Load = **3+6+9**	**3.404**	kW
11	Total LED Lighting Load = **6+9**	**3.204**	kW
12	% of Usage of LED Lighting to Total Lighting Load= **(11) *100 /(10)**	**94.12**	Hrs

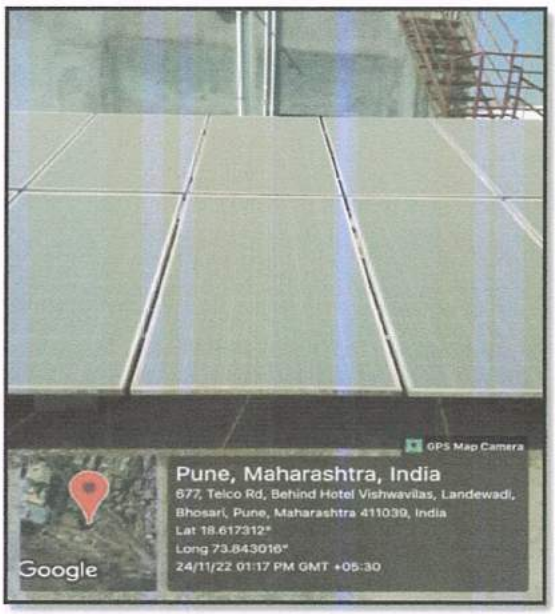
CHAPTER-VI
STUDY OF RENEWABLE ENERGY & ENERGY EFFICIENCY

6.1 Usage of Renewable Energy:

The College has installed:

- Roof Top Solar PV Plant of Capacity **10 kWp**

Photograph of Roof Top Solar PV Plant:



6.2 Energy Efficiency Measures adopted:

- The College has Energy Efficient LED Fittings.
- Usage of BEE STAR Rated Equipment

GREEN AUDIT REPORT

of

RAJMATA JIJAU SHIKSHAN PRASARAK MANDAL'S, ARTS, COMMERCE & SCIENCE COLLEGE,

Landewadi, Bhosari, Pune 411 039

Year: 2022-23

Prepared by:

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: engress123@gmail.com

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)

GREEN AUDIT CERTIFICATE

Certificate No: ES/ RJSPMACSC/22-23/02 **Date: 10/7/2023**

This is to certify that we have conducted Green Audit at Rajmata Jijau Shikshan Prasarak Mandal's Arts, Commerce & Science College, Landewadi, Bhosari in the Year 2022-23.

The College has adopted following Green & Sustainable Practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Maximum usage of Day Lighting
- Installation of 10 kWp Capacity Roof Top Solar PV Plant
- Segregation of Waste at Source
- Bio composting Pit for conversion of Organic Waste
- Provision of Sanitary Waste Incinerator for disposal of Sanitary Waste
- Rain Water Management Project
- Maintenance of Good Internal Road
- Maintenance of Internal Garden
- Provision of Ramp for Divyangajan
- Creation of Awareness by Display of Posters on Energy Conservation

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

For Engress Services,

A Y Mehendale,
B E- Mech, M Tech-Energy, Certified Energy Auditor, EA-8192
ASSOCHAM GEM Certified Professional: GEM: 22/788

ENGRESS SERVICES PUNE

REGISTRATION CERTIFICATES

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency

(Government of Maharashtra Institution)

Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandry, Aundh, Pune, Maharashtra 411067

Ph No: 020-35000450

Email: eec@mahaurja.com, Web: www.mahaurja.com

EEC/N/2022-23/CR-43/1709 10th May, 2022

CERTIFICATE OF REGISTRATION

FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with *MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)* under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : M/s Engress Services
Vaishshree, 26, Nirmal Bag Society,
Near Muktangan English School,
Parvati, Pune - 411 009

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Registration Number : *MEDA/EEC/2022-23/Class A/EA-32.*

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- This empanelment is valid till **09th May, 2024** from the date of registration, to carry out energy audits under the Energy Conservation Programme.
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

MEDA Registration Certificate

ASSOCHAM

GEM Certificate

ASSOCHAM hereby certifies that

Mr. A Y Mehendale

has successfully passed the

Green and Eco-friendly Movement Certified Professional Test (GEM CP)

with

"Excellent Performance"

on

06 June, 2022

He/she is now eligible to execute the GEM Sustainability Certification Projects.
ASSOCHAM feels proud to award the GEM Certified Professional title to him/her.

Pankaj R. Dharkar
Chairman, GEM

GEM CP 22/788

Deepak Sood
Secretary General, ASSOCHAM

ASSOCHAM GEM CP Certificate

Certificate of Registration

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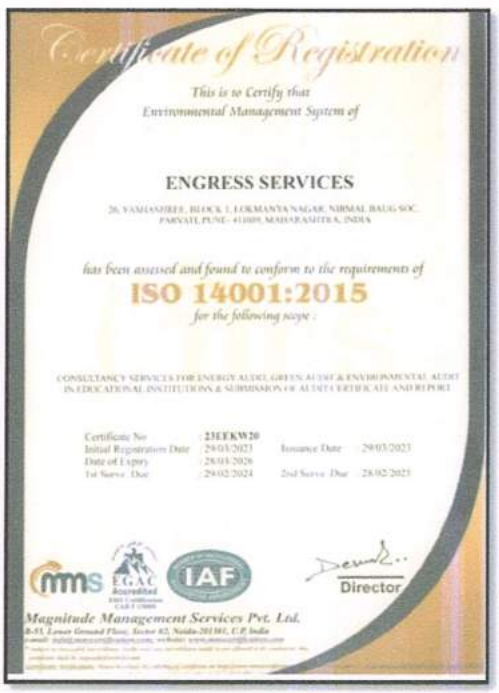
Director

Magnitude Management Services Pvt. Ltd.
B-55, Lower Ground Floor, Sector 02, Noida-201301, U.P. India

ISO: 9001-2015 Certificate



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ENGRESS SERVICES PUNE

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

EXECUTIVE SUMMARY

1. Rajmata Jijau Shikshan Prasarak Mandal's Arts, Commerce & Science College, Landewadi, Bhosari, Pune consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

2. Present Energy Consumption & CO_2 Emission:

No	Particulars	Value	Unit
1	Annual Energy Purchased	**19765**	kWh
2	Annual CO_2 Emissions	**19.77**	MT

3. Renewable Energy & Reduction in CO_2 Emissions:

- The College has installed Roof Top Solar PV Plant of Capacity **10 kWp.**
- The Energy generated by Solar PV Plant in 2022-23 is **12000 kWh.**
- Reduction in CO_2 Emissions in 2022-23 is **10.8 MT**

4. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Provision of Bio Composting Pit
3	Sanitary Waste	Provision of Sanitary Waste Incinerator
4	E Waste	Disposed of through Authorized Agency

5. Rain Water Harvesting:

The College has installed Pipes from the terrace and the Rain water falling on the terrace is stored in an underground Tank and is further used for domestic purpose.

6. Green & Sustainable Practices:

- Maintenance of good Internal Road
- Tree Plantation in the campus.
- Provision of Ramp for Divyangajan
- Creation of awareness on Energy Conservation by Display of Posters

7. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
2. Energy generated by Roof Top Solar PV Plant: **4 kWh/kWp per Day**
3. Annual Solar Energy generation Days: **300 Nos**

8. References:

- For CO_2 Emissions: www.tatapower.com
- For Solar PV Energy generation: www.solarrooftop.gov.in

ABBREVIATIONS

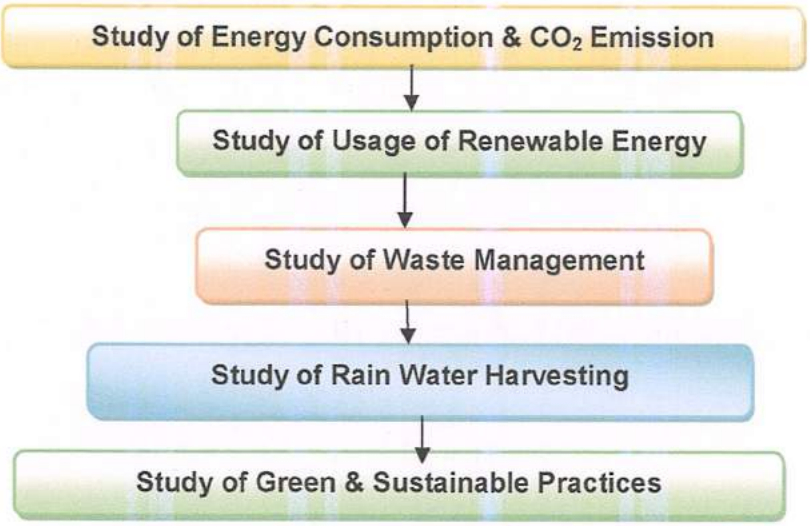
RJSPM	Rajmata Jijau Shikshan Prasarak Mandal
kWh	Kilo Watt Hour
LPD	Liters Per Day
Kg	Kilo Gram
MT	Metric Ton
CO_2	Carbon Di Oxide
Qty	Quantity

CHAPTER-I
INTRODUCTION

1.1 Introduction:

A Green Audit is conducted at Rajmata Jijau Shikshan Prasarak Mandal's Arts, Commerce & Science College, Landewadi, Bhosari, Pune.

1.2 Audit Procedural Steps:



1.3 College Location Image:

CHAPTER-II
STUDY OF ENERGY CONSUMPTION & CO_2 EMISSION

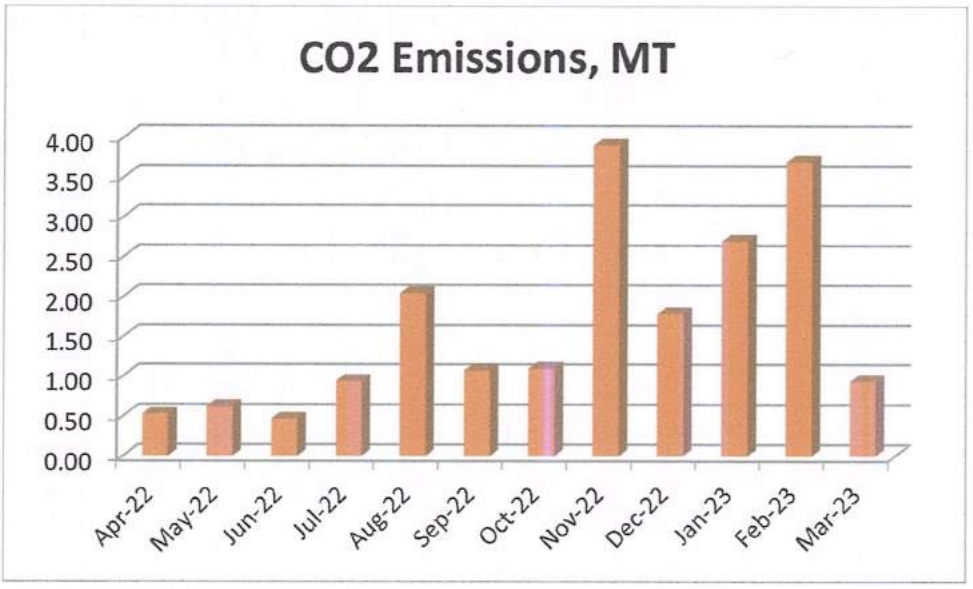
A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities. **Basis for computation of CO_2 Emissions:**

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Table No 1: Month wise CO_2 Emissions:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Apr-22	527	0.53
2	May-22	620	0.62
3	Jun-22	464	0.46
4	Jul-22	936	0.94
5	Aug-22	2044	2.04
6	Sep-22	1070	1.07
7	Oct-22	1094	1.09
8	Nov-22	3900	3.90
9	Dec-22	1787	1.79
10	Jan-23	2694	2.69
11	Feb-23	3694	3.69
12	Mar-23	935	0.94
13	Total	19765	19.77
14	Maximum	3900	3.90
15	Minimum	464	0.46
16	Average	1647.08	1.65

Chart No 1: Month wise CO_2 Emissions:



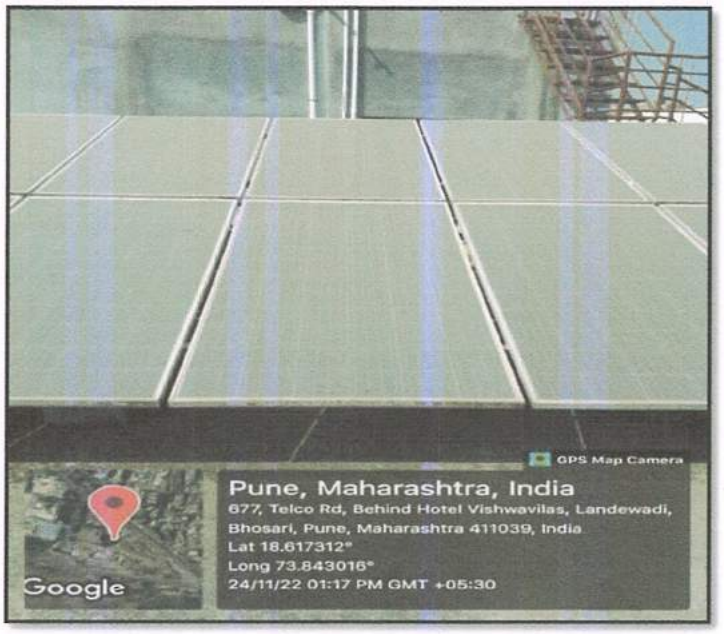
CHAPTER III
STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **10 kWp**
In the following Table, we present the reduction in CO_2 emissions due to Solar Energy:

Table No 2: Computation of Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	10	kWp
2	Energy Generated in per kWp	4	4 kWh/kWp
3	Annual Solar Energy generation Days	300	Nos
4	Energy Generated in the Year: 21-22	**12000**	kWh
5	1 kWh of Electrical Energy saves	**0.9**	Kg/kWh
6	**Qty of CO_2 Saved by Solar PV Plant =(4)*(5) /1000**	**10.8**	**MT of CO_2**

Photograph of Roof Top Solar PV Plant:



CHAPTER IV
STUDY OF WASTE MANAGEMENT

5.1 Segregation of Waste at Source:

The College has good housekeeping practices. The Waste is segregated at source. Waste collection Bins are placed at strategic locations.

Photograph of Waste Collection Bins:

5.2 Organic Waste Management:

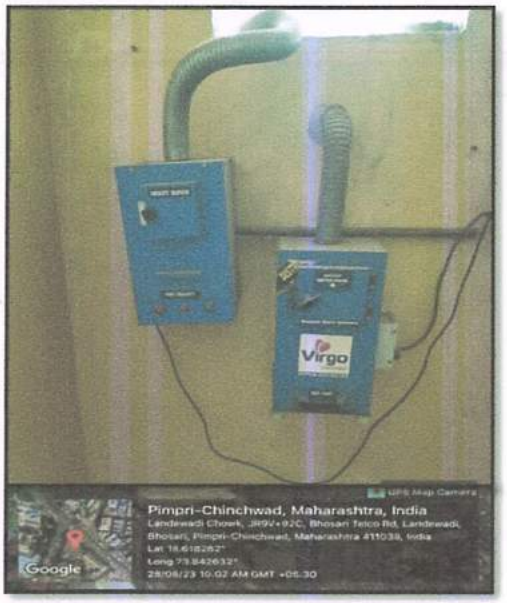
The College has a Bio Composting Pit to convert the Organic Waste like leaves into bio compost, which in turn is used as fertilizer for the own garden.

Photograph of Bio Composting Pit:

5.3 Sanitary Waste Management:

The College has installed a Sanitary Waste Incinerator to dispose of the Sanitary Waste.

Photograph of Sanitary Waste Incinerator:



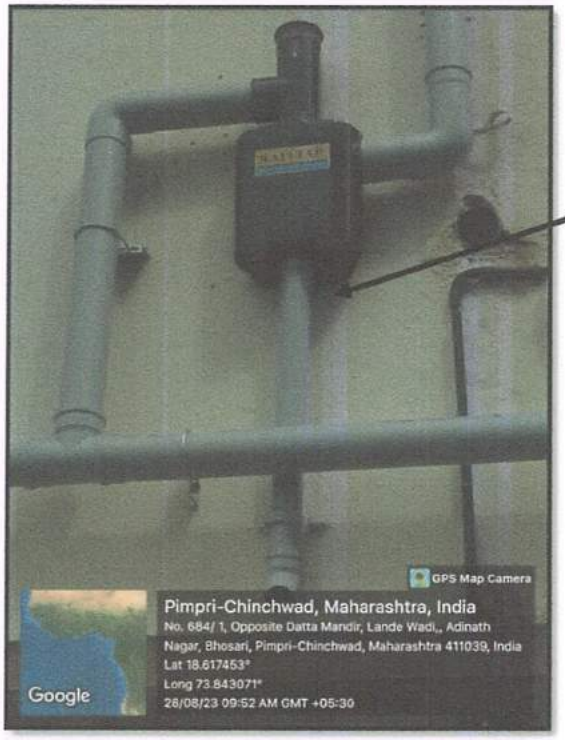
5.4 E Waste Management:

The E-Waste is disposed through Authorized Agency.

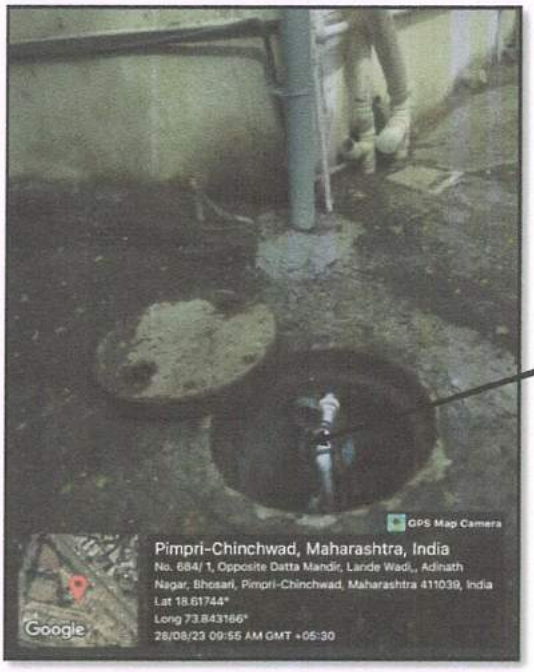
CHAPTER V
STUDY OF RAIN WATER HARVESTING

The College has installed Pipes from the terrace and the Rain water falling on the terrace is stored in an underground Tank and is further used for domestic purpose.

Photograph of Rain Water Management Pipe:



Rain Water Carrying Pipe & Filter Arrangement



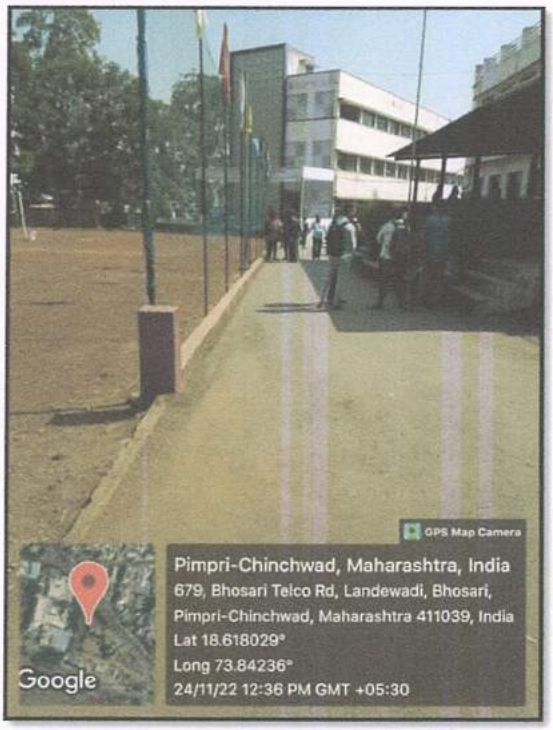
Rain Water Storage Tank

CHAPTER VI
STUDY OF GREEN & SUSTAINABLE PRACTICES

6.1 Pedestrian Friendly Road & Internal Tree Plantation:

The College has well maintained internal road to facilitate the easy movement of the students within the campus. The College has well maintained landscaped garden in the campus.

Photograph of Internal Road & Tree plantation:



6.2 Provision of Ramp for Divyangajan:

For easy movement of Divyangajan, the College has made provision of Ramp.

Photograph of Ramp:

6.3 Creation of Awareness about Energy Conservation:

The College has displayed posters emphasizing on importance of Energy Conservation.

Photograph of Poster on Energy Conservation:

ANNEXURE-1:
LIST OF TREES IN THE CAMPUS:

List of Trees in the Campus:

No	Name of Plant
1	Fig Tree
2	Lemon Tree
3	Indian Soap Berry
4	Indian Gooseberry
5	Mlabar Nut
6	Ginger
7	Curry Leaves
8	Air Plant/ Life Plant
9	Ashwagandha
10	Amaltas / Golden Shower Tree
11	Bahera / Beleris
12	Arjuna
13	Basil
14	Ram Tulasi
15	Holy Basil
16	Fern
17	Insulin Plant
18	Lemon Grass
19	Brahmi
20	Adulsa
21	Jasmine
22	Rudraksha
23	Shatavari
24	Mint
25	Karanti
26	China Rose
27	Aloe Vera
28	China Roase
29	Curry Leaves
30	Tulasi
31	Mimosa Pudica

ENVIRONMENTAL AUDIT REPORT

of

RAJMATA JIJAU SHIKSHAN PRASARAK MANDAL'S, ARTS, COMMERCE & SCIENCE COLLEGE,

Landewadi, Bhosari, Pune 411 039

Year: 2022-23

Prepared by:

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society
Near Muktangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: engress123@gmail.com

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society, Near Muktangan English School,
Parvati, Pune 411 009 Tel: 09890444795 Email: engress123@gmail.com
MEDA Registration No: ECN/2022-23/CR-43/1709
ISO: 9001-2015 Certified (Cert No: 23EQKC13),
ISO: 14001-2015 Certified (Cert No: 23EEKW20)

ENVIRONMENTAL AUDIT CERTIFICATE

Certificate No: ES/ RJSPMACSC/22-23/03 **Date: 10/7/2023**

This is to certify that we have conducted Environmental Audit at Rajmata Jijau Shikshan Prasarak Mandal's Arts, Commerce & Science College, Landewadi, Bhosari in the Year 2022-23.

The College has adopted following Environment Friendly Practices:

- Usage of Energy Efficient LED Fittings
- Maximum usage of Day Lighting
- Installation of 10 kWp Capacity Roof Top Solar PV Plant
- Segregation of Waste at Source
- Bio composting Pit for conversion of Organic Waste.
- Provision of Sanitary Waste Incinerator for disposal of Sanitary Waste
- Rain Water Harvesting Project
- Maintenance of Internal Garden
- Creation of Awareness by Display of Posters Ban on Energy Conservation

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

For Engress Services,

ENGRESS SERVICES PUNE

A Y Mehendale,
B E- Mech, M Tech-Energy, Certified Energy Auditor, EA-8192
ASSOCHAM GEM Certified Professional: GEM: 22/788

REGISTRATION CERTIFICATES

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary,
Aundh, Pune, Maharashtra 411067
Ph No: 020-35000450
Email: enq@mahaurja.com, Web: www.mahaurja.com

MEDA/ECN/2022-23/CR-413709 — 10th May, 2022

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with *MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)* under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : M/s Engress Services
Yashshree, 26, Nirmal Bag Society,
Near Muktangan English School,
Parvati, Pune - 411 009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

Registration Number : *MEDA/ECN/2022-23/Class A/EA-32.*

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **09th May, 2024** from the date of registration, to carry out energy audits under the Energy Conservation Programme.
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

MEDA Registration Certificate

ASSOCHAM

GEM Certificate

ASSOCHAM hereby certifies that

Mr. A Y Mehendale

has successfully passed the
Green and Eco-friendly Movement Certified Professional Test (GEM CP)
with
"Excellent Performance"
on
06 June, 2022

He/she is now eligible to execute the GEM Sustainability Certification Projects.
ASSOCHAM feels proud to award the GEM Certified Professional title to him/her.

Pankaj R. Dharkar
Chairman, GEM

GEM CP 22/788

Deepak Sood
Secretary General, ASSOCHAM

GEM Certified Professional Certificate

Certificate of Registration

This is to Certify that
Quality Management System of

ENGRESS SERVICES

26, YASHASHREE, BLOCK 1, LOKMANYA NAGAR, NIRMAL BAUG SOC, PARVATI, PUNE- 411009, MAHARASHTRA, INDIA

has been assessed and found to conform to the requirements of
ISO 9001:2015
for the following scope :

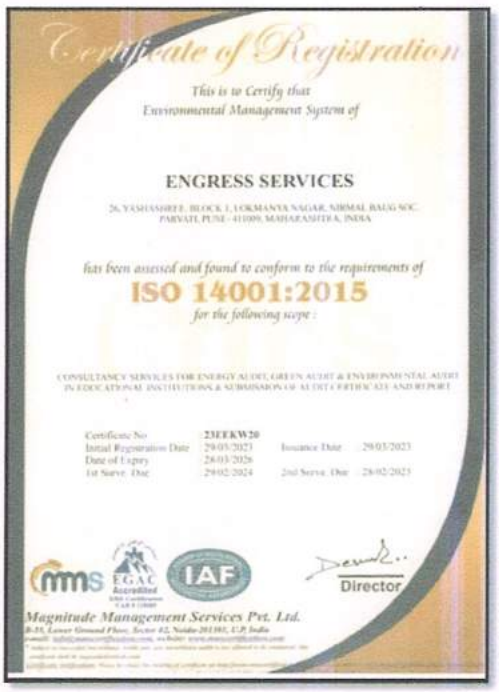
CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT

Certificate No	23EQ8C13		
Initial Registration Date	27/03/2023	Issuance Date	27/03/2023
Date of Expiry	26/03/2026		
1st Surve. Due	27/02/2024	2nd Surve. Due	27/02/2025

Director

Magnitude Management Services Pvt. Ltd.
B-55, Lower Ground Floor, Sector 02, Noida-201301, U.P. India

ISO: 9001-2015 Certificate



Certificate of Registration

This is to Certify that
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ISO 14001:2015
for the following scope :

CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT

Certificate No	23EEKW20		
Initial Registration Date	29/03/2023	Issuance Date	29/03/2023
Date of Expiry	28/03/2026		
1st Surve. Due	29/02/2024	2nd Surve. Due	28/02/2025

Director

Magnitude Management Services Pvt. Ltd.

ISO: 14001-2015 Certificate

ENGRESS SERVICES PUNE

INDEX

ACKNOWLEDGEMENT

We at Engress Services, Pune, express our sincere gratitude to the management of RJSPM's Arts, Commerce & Science College, Landewadi, Bhosari, Pune for awarding us the assignment of Environmental Audit of their Landewadi Campus for the Year: 2022-23.

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

EXECUTIVE SUMMARY

1. Rajmata Jijau Shikshan Prasarak Mandal's Arts, Commerce & Science College, Landewadi, Bhosari, Pune consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

2. Pollution due to College Activities:

- **Air pollution:** Mainly CO_2 on account of Electricity Consumption
- **Solid Waste:** Bio degradable Garden Waste
- **Liquid Waste:** Human liquid waste

3. Present Energy Consumption & CO_2 Emission:

No	Particulars	Value	Unit
1	Annual Energy Purchased	19765	kWh
2	Annual CO_2 Emissions	19.77	MT

4. Renewable Energy & Reduction in CO_2 Emissions:

- The College has installed Roof Top Solar PV Plant of Capacity **10 kWp.**
- The Energy generated by Solar PV Plant in 22-23 is **12000 kWh.**
- Reduction in CO_2 Emissions in 22-23 is **10.8 MT**

5. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	57	34	49
2	Minimum	45	27	30

6. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, ^0C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	27.3	76	140	45
2	Minimum	26.3	74	96	41.6

7. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Provision of Bio Composting Pit
3	Sanitary Waste	Provision of Sanitary Waste Incinerator
4	E Waste	Disposed of through Authorized Agency

ENGRESS SERVICES PUNE

8. Rain Water Harvesting:

The College has installed Pipes from the terrace and the Rain water falling on the terrace is stored in an underground Tank and is further used for domestic purpose.

9. Environment Friendly Initiatives:

- Tree Plantation in the campus.
- Creation of awareness on Energy Conservation Display of Posters

10. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg** of CO_2 into atmosphere
2. Energy generated by Roof Top Solar PV Plant: **4 kWh/kWp per Day**
3. Annual Solar Energy generation Days: **300 Nos**

11. References:

- For CO_2 Emissions: www.tatapower.com
- For Solar PV Energy generation: www.solarrooftop.gov.in
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI Quality Standards: www.cpcb.com

ABBREVIATIONS

Kg	:	Kilo Gram
RSSPM	:	Rajmata Jijau Shikshan Prasarak Mandal
MT	:	Metric Ton
kWh	:	kilo-Watt Hour
LPD	:	Liters per Day
LED	:	Light Emitting Diode
AQI	:	Air Quality Index
PM-2.5	:	Particulate Matter of Size 2.5 Micron
PM-10	:	Particulate Matter of Size 10 Micron
CPCB	:	Central Pollution Control Board
ISHRAE	:	The Indian Society of Heating & Refrigerating & Air Conditioning Engineers

CHAPTER-I
INTRODUCTION

1. Important Definitions:

1.1. Environment: Definition as per environment Protection Act: 1986

Environment includes water, air and land and the inter-relationship which exists among and between Water, Air, Land and Human beings, other living creatures, plants microorganism and property

1.2. Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are compiled with and adequate care has been taken towards environmental protection and preservation

According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment

1.3. Environmental Pollutant: means any solid, liquid and gaseous substance present in the concentration as may be, or tend to be, injurious to Environment.

1.4 Audit Procedural Steps:

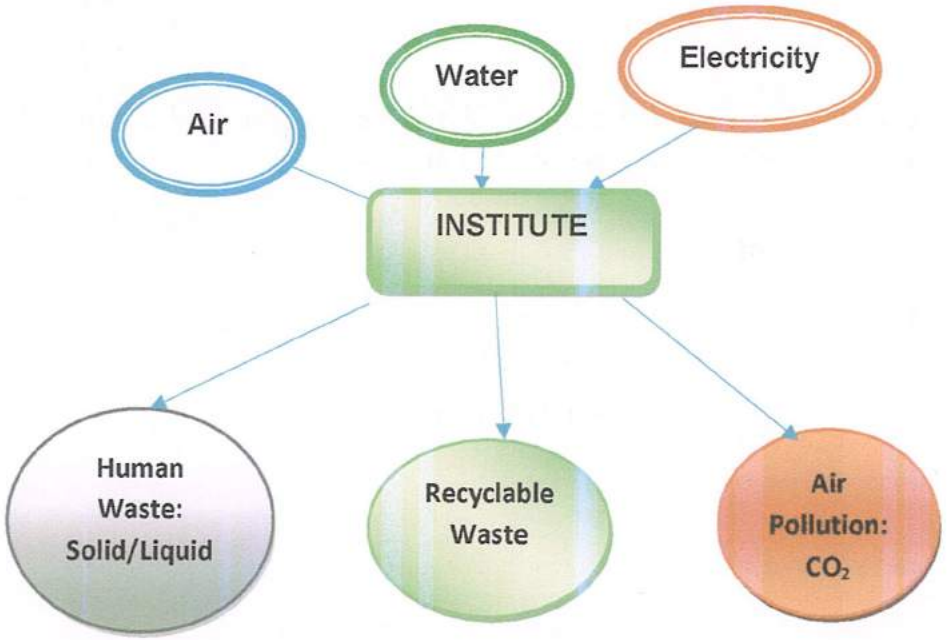
1.3 College Location Image:

CHAPTER-II
STUDY OF RESOURCE CONSUMPTION & CO_2 EMISSION

The College consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

We try to draw a schematic diagram for the College System & Environment as under.
Chart No 1: Representation of College as System & Study of Resources & Waste



Now we compute the Generation of CO_2 on account of consumption of Electrical Energy. The basis of Calculation for CO_2 emissions due to Electrical Energy is as under.

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Table No 1: Study of Purchase of Energy & CO_2 Emissions: 22-23:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Apr-22	527	0.53
2	May-22	620	0.62
3	Jun-22	464	0.46
4	Jul-22	936	0.94
5	Aug-22	2044	2.04
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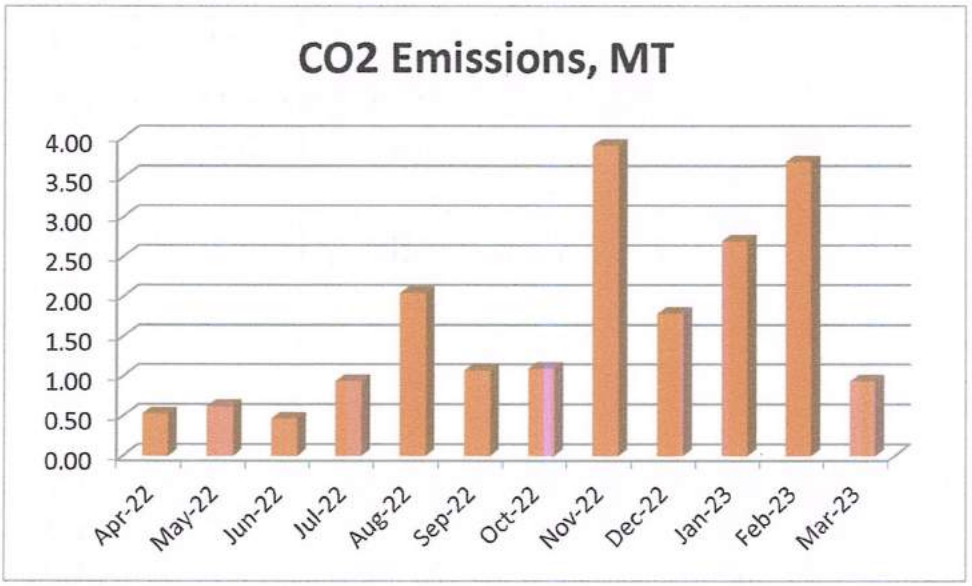
Chart No 2: Month wise CO_2 Emissions:



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The College has installed Roof Top Solar PV Plant of Capacity **10 kWp**
In the following Table, we present the reduction in CO_2 emissions due to Solar Energy:

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No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	10	kWp
2	Energy Generated in per kWp	4	4 kWh/kWp
3	Annual Solar Energy generation Days	300	Nos
4	Energy Generated in the Year: 21-22	**12000**	kWh
5	1 kWh of Electrical Energy saves	**0.9**	Kg/kWh
6	**Qty of CO_2 Saved by Solar PV Plant =(4)*(5) /1000**	**10.8**	**MT of CO_2**

Photograph of Roof Top Solar PV Plant:

CHAPTER IV
STUDY OF INDOOR AIR QUALITY

4.1 Importance of Air Quality:

Air: The common name given to the atmospheric gases used in breathing and photosynthesis.

By volume, Dry Air contains 78.09% Nitrogen, 20.95% Oxygen, 0.93% Argon, 0.039% carbon dioxide, and small amounts of other gases.

On average, a person inhales about **14,000 liters** of air every day. Therefore, poor air quality may affect the quality of life now and for future generations by affecting the health, the environment, the economy and the city's livability.

Air quality is a measure of the suitability of air for breathing by people, plants and animals.

4.2 Air Quality Index:

An **Air Quality Index (AQI)** is a number used by government agencies to measure the **air pollution** levels and communicate it to the population.

We present herewith following important Parameters.

1. AQI- Air Quality Index
2. PM-2.5- Particulate Matter of Size 2.5 micron
3. PM-10- Particulate Matter of Size 10 micron

Table No 3: Indoor Air Quality Parameters:

No	Location	AQI	PM-2.5	PM-10
	Ground Floor			
1	Office	51	31	39
2	Classroom	45	27	30
	First Floor			
3	Dept of BBA	56	33	44
4	IT LAB	51	31	49
	Second Floor			
5	Chemistry Lab	53	32	37
6	Physics Lab	57	34	44
	Third Floor			
7	Classroom	50	28	31
8	Classroom	52	32	48
	Maximum	**57**	**34**	**49**
	Minimum	**45**	**27**	**30**

CHAPTER V
STUDY OF INDOOR COMFORT CONDITION PARAMETERS

In this Chapter, we present the various Indoor Comfort Parameters measured during the Audit. The Parameters include:

1. Temperature
2. Humidity
3. Lux Level
4. Noise Level.

Table No 4: Study of Indoor Comfort Condition Parameters:

No	Location	Temperature , ^{0}C	Humidity, %	Lux Level	Noise Level, dB
	Ground Floor				
1	Office	26.6	76	114	45
2	Classroom	26.5	75	123	44.3
	First Floor				
3	Dept of BBA	26.4	75	110	42.9
4	IT LAB	26.3	76	96	41.6
	Second Floor				
5	Chemistry Lab	26.3	75	102	43
6	Physics Lab	26.3	76	119	44
	Third Floor				
7	Classroom	27.3	74	140	45
8	Classroom	27.3	74	136	44.8
	Maximum	**27.3**	**76**	**140**	**45**
	Minimum	**26.3**	**74**	**96**	**41.6**

CHAPTER VI
STUDY OF WASTE MANAGEMENT

6.1 Segregation of Waste at Source:

The College has good housekeeping practices. The Waste is segregated at source. Waste collection Bins are placed at strategic locations.

Photograph of Waste Collection Bins:

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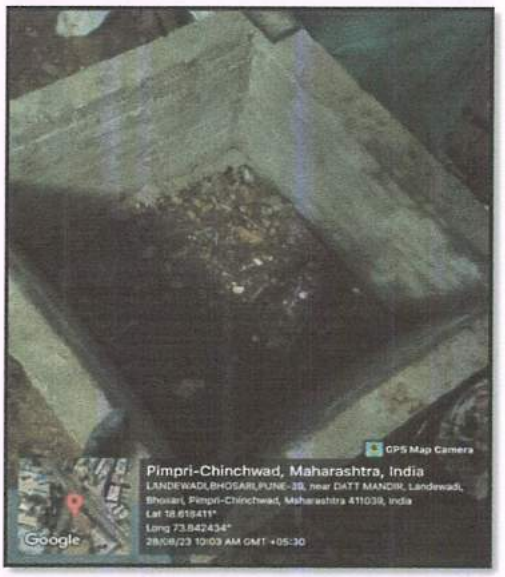
The College has a Bio Composting Pit to convert the Organic Waste like leaves into bio compost, which in turn is used as fertilizer for the own garden.

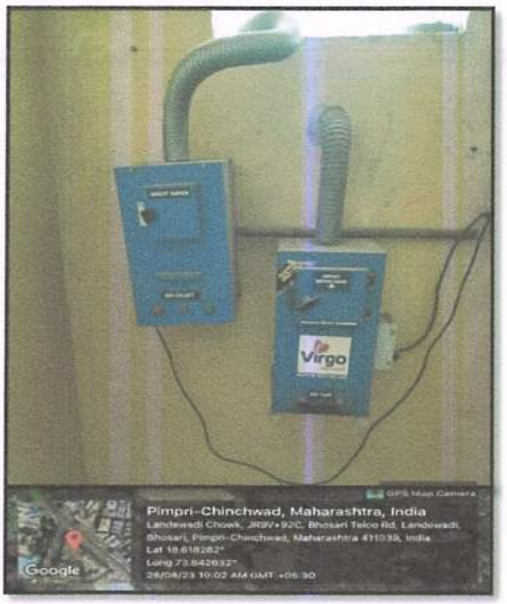
Photograph of Bio Composting Pit:



6.3 Sanitary Waste Management:

The College has installed a Sanitary Waste Incinerator to dispose of the Sanitary Waste.

Photograph of Sanitary Waste Incinerator:



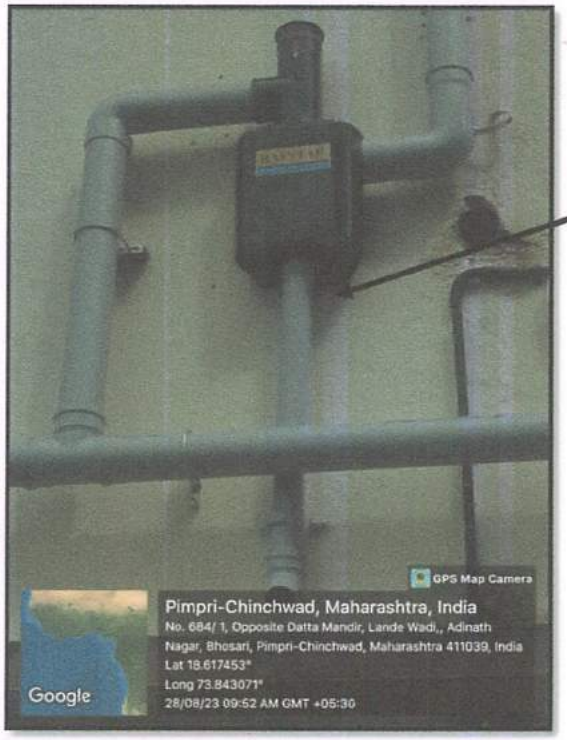
6.4 E Waste Management:

The E-Waste is disposed through Authorized Agency.

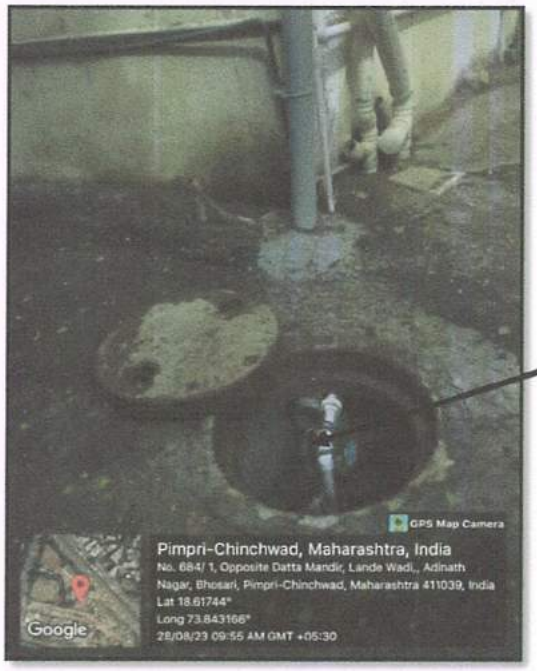
CHAPTER-VII
STUDY OF RAIN WATER HARVESTING

The College has installed Pipes from the terrace and the Rain water falling on the terrace is stored in an underground Tank and is further used for domestic purpose.

Photograph of Rain Water Management Pipe:



Rain Water Carrying Pipe & Filter Arrangement



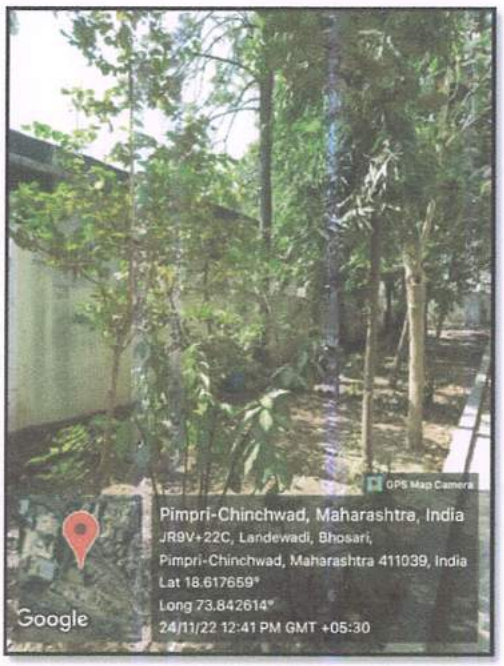
Rain Water Storage Tank

CHAPTER-VIII
STUDY OF ECO FRIENDLY INITIATIVES

8.1 Internal Tree Plantation:

The College has Tree Plantation in the campus.

Photograph of Tree plantation:



8.2 Creation of Awareness about Energy Conservation:

The College has displayed posters emphasizing on importance of Energy Conservation.

Photograph of Poster on Energy Conservation:

ANNEXURE-I:
VARIOUS AIR QUALITY, NOISE & COMFORT STANDARDS:

1. Category Wise Air Quality Index Values & Concentration of PM 2.5 & PM10:

No	Category	AQI Value	Concentration Range, PM 2.5	Concentration Range, PM 10
1	Good	0 to 50	0 to 30	0 to 50
2	Satisfactory	51 to 100	31 to 60	51 to 100
3	Moderately Polluted	101 to 200	61 to 90	101 to 250
4	Poor	201 to 300	91 to 120	251 to 350
5	Very Poor	301 to 400	121 to 250	351 to 430
6	Severe	401 to 500	250 +	430 +

2. Recommended Noise Level Standards:

No	Location	Noise Level dB
1	Auditoriums	20-25
2	Outdoor Playground	55
3	Occupied Class Room	40-45
4	Un occupied Class Room	35
5	Apartment, Homes	35-40
6	Offices	45-50
7	Libraries	35-40
8	Restaurants	50-55

3. Thermal Comfort Conditions: For Non-conditioned Buildings:

No	Parameter	Value
1	Temperature	Less Than 33^0C
2	Humidity	Less Than 70%