7.1.6 Quality audits on environment and energy regularly undertaken by the institution

INDEX

ENERGY AUDIT REPORT

of

Kamala Education Society's,

PRATIBHA COLLEGE OF COMMERCE & COMPUTER STUDIES,

Off Mumbai Pune Road, Chinchwad, Pune 411 019

KAMALA
Education Society

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
PUNE

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/PCCCS/22-23/01 **Date: 29/6/2023**

This is to certify that we have conducted Energy Audit at Kamala Educational Society's, Pratibha College of Commerce & Computer Studies, Chinchwad, Pune in the year 2022-23.

.The Institute has adopted following Energy Efficient Practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated Equipment
- Maximum usage of Day Lighting
- Installation of 25 kWp Roof Top Solar PV Plant.

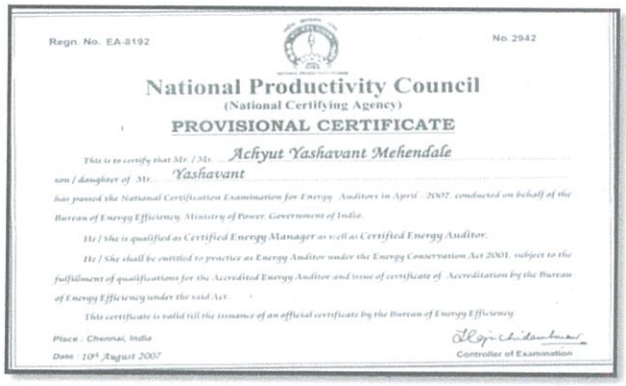
We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For Engress Services,

ENGRESS SERVICES PUNE

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

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 - 2002, 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.

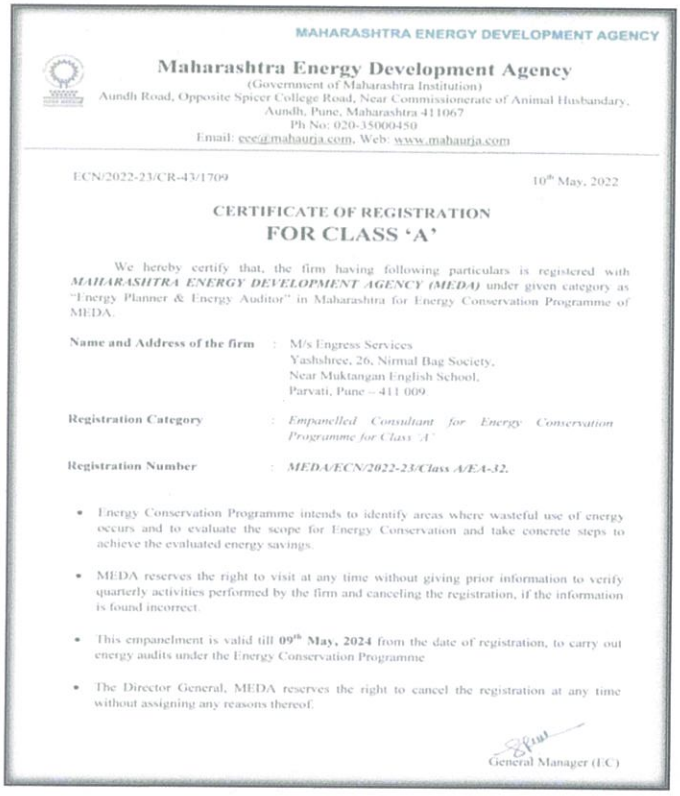
He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

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

BEE 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.

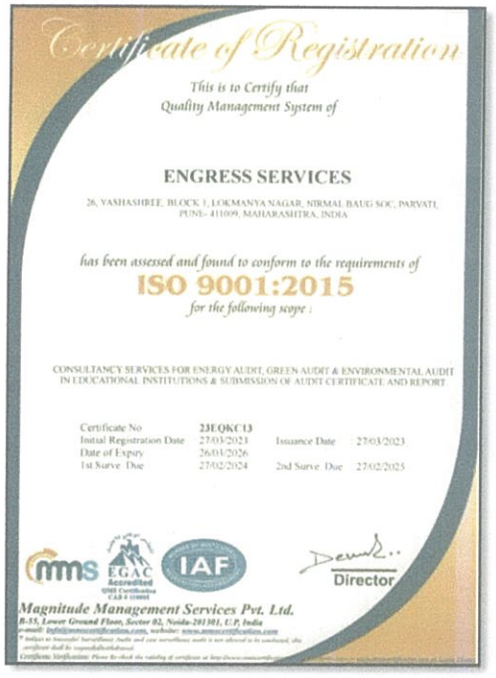
Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

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 (EC)

MEDA Empanelment 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 :

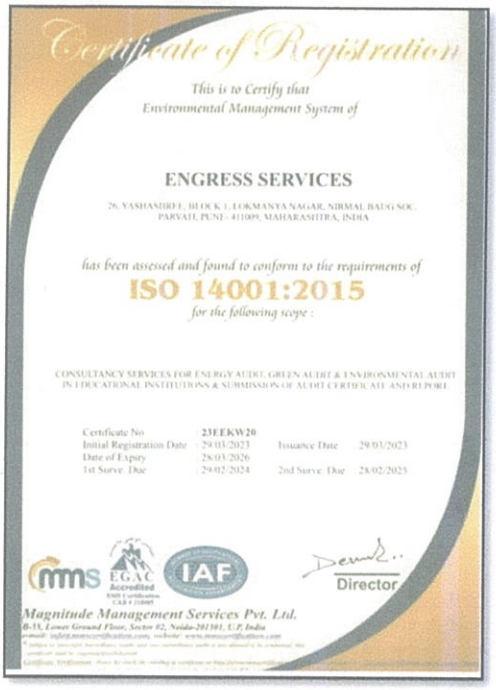
CONSULTANCY SERVICES FOR ENERGY AUDIT, GREEN AUDIT & ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS & SUBMISSION OF AUDIT CERTIFICATE AND REPORT

Certificate No	23EQKC13		
Initial Registration Date	27/03/2023	Issuance Date	27/03/2023
Date of Expiry	26/01/2026		
1st Surve Due	27/02/2024	2nd Surve Due	27/02/2025

Director

Magnitude Management Services Pvt. Ltd.
B-35, Lower Ground Floor, Sector 02, Noida-201301, U.P. India

ISO: 9001-2015 Certificate



Certificate of Registration

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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 :

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.
B-35, Lower Ground Floor, Sector 02, Noida-201301, U.P. India

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 Kamala Education Society's, Pratibha College of Commerce & Computer Studies, Pune for awarding us the assignment of Energy Audit of their campus for the Year: 2022-23.

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

EXECUTIVE SUMMARY

1. Kamala Education Society's, Pratibha College of Commerce & Computer Studies, 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	**121**	kW
2	Annual Energy Purchased	**73496**	kWh
3	Annual CO_2 Emissions	**66.15**	MT

3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	**103496**	kWh
2	Total Built up area of College	**7843.98**	m^2
3	Energy Performance Index =(1) / (2)	**13.19**	kWh/m^2

4. Study of Lighting:

No	Particulars	Value	Unit
1	Lighting Power Density	**2.78**	W/m^2
2	% of Usage of LED Lighting to Total Lighting Load	**100**	%

5. Renewable Energy & Energy Efficiency Projects:

- Usage of Energy Efficient LED fittings
- Installation of **25 kWp Roof Top** Solar PV Plant
- Sensor based operation of Lights

6. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg** of CO_2 into atmosphere
2. **1 kWp** Solar PV system generates **4 kWh** of Electrical Energy 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

AC	:	Air conditioner
LED	:	Light Emitting Diode
kWh	:	kilo-Watt Hour
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
D/L	:	Down Lighter
PC	:	Personal Computer
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

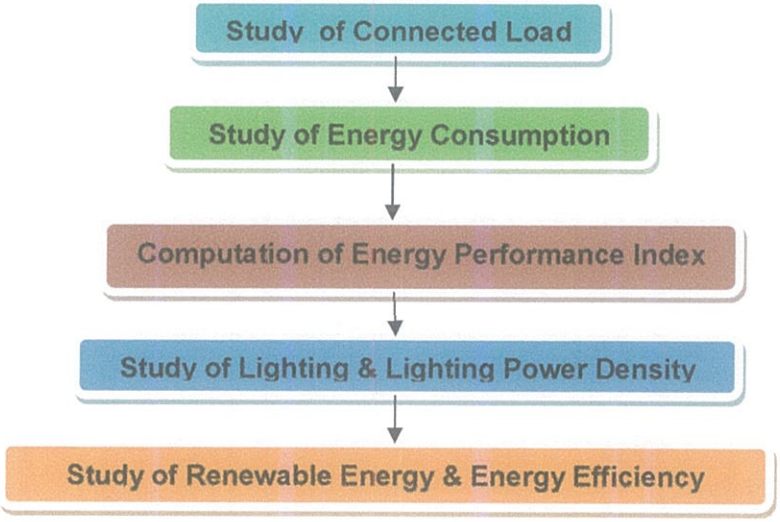
1.1 Introduction:

An Energy Audit is conducted at Kamala Education Society's, Pratibha College of Commerce & Computer Studies, Pune.

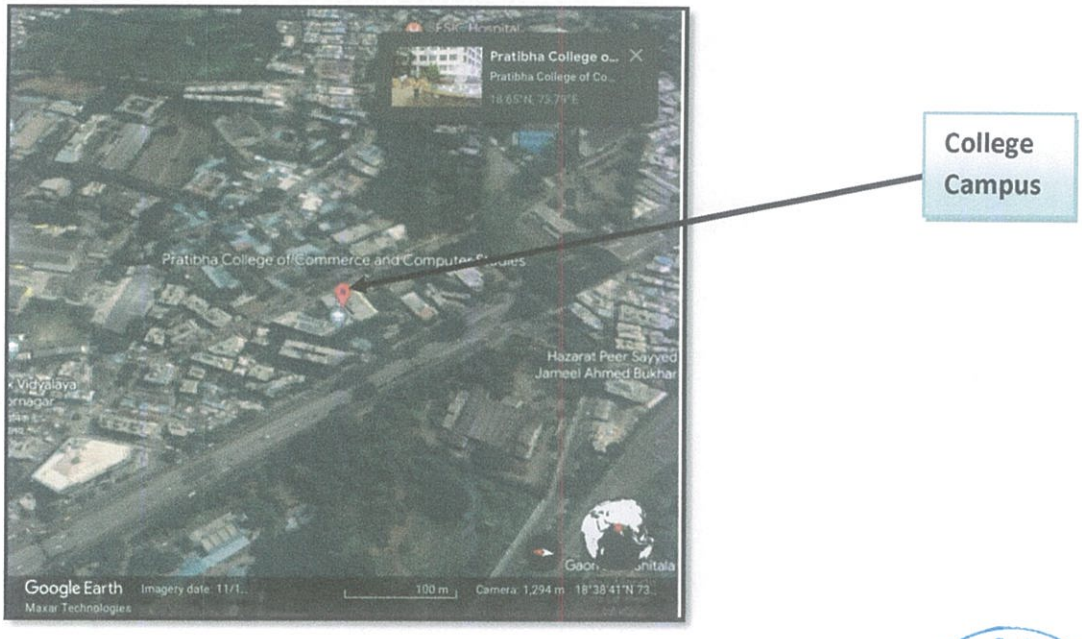
The guidelines followed for conducting the Energy Audit are:

- 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 Institute Location Image:



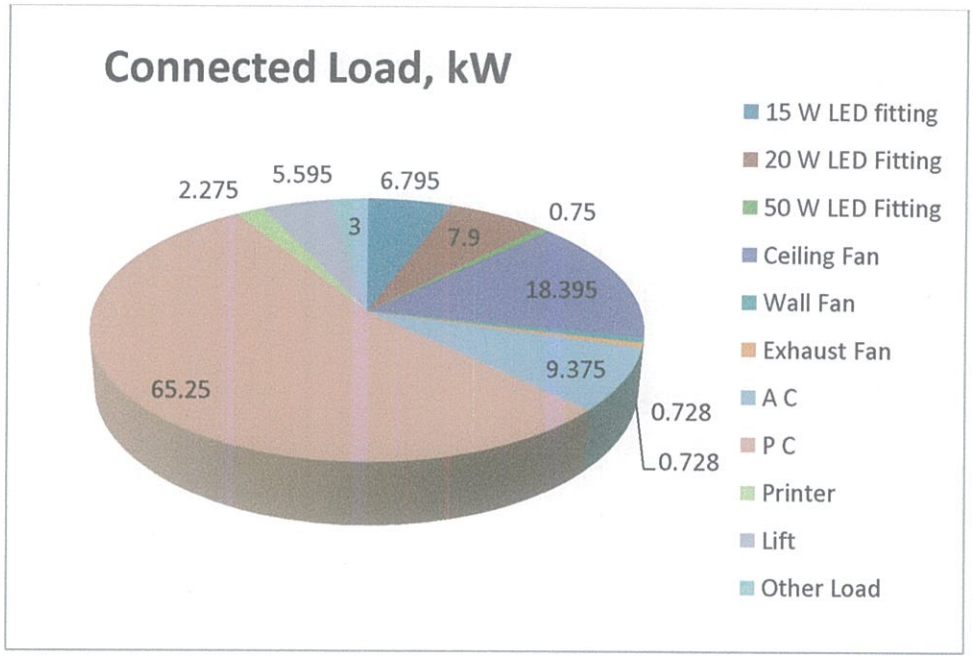
CHAPTER-II
STUDY OF CONNECTED LOAD

In this chapter, we present the details of various Electrical loads as under.

Table No 1: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/unit	Load, kW
1	15 W LED fitting	453	15	6.795
2	20 W LED Fitting	395	20	7.9
3	50 W LED Fitting	15	50	0.75
4	Ceiling Fan	283	65	18.395
5	Wall Fan	14	52	0.728
6	Exhaust Fan	14	52	0.728
7	A C	5	1875	9.375
8	P C	435	150	65.25
9	Printer	13	175	2.275
10	Lift	1	5595	5.595
11	Other Load	20	150	3
12	**Total**			**121**

Chart No 1: Details of Connected Load:



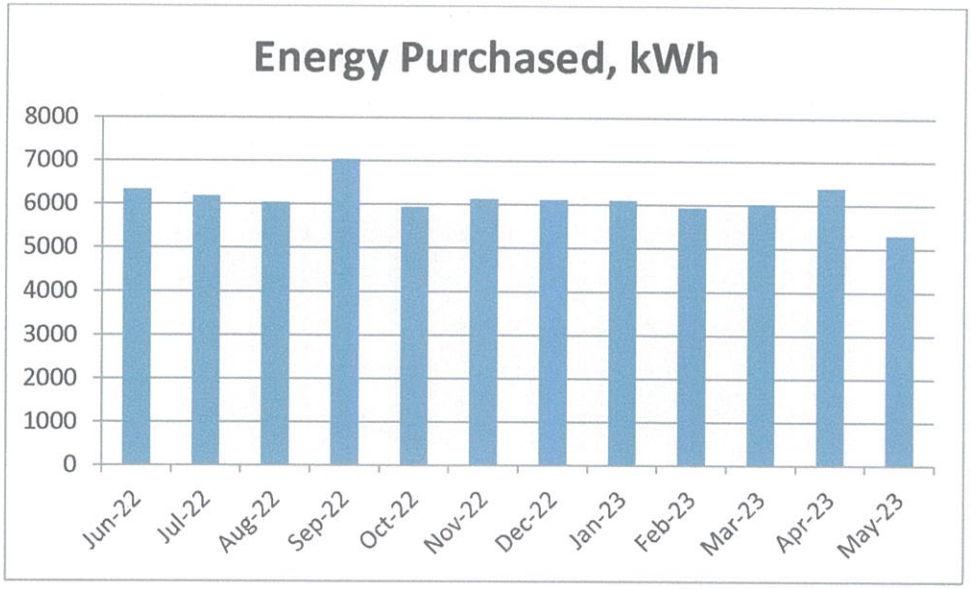
CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Electricity Energy.

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

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Jun-22	6325	5.69
2	Jul-22	6179	5.56
3	Aug-22	6036	5.43
4	Sep-22	7036	6.33
5	Oct-22	5935	5.34
6	Nov-22	6127	5.51
7	Dec-22	6110	5.50
8	Jan-23	6096	5.49
9	Feb-23	5936	5.34
10	Mar-23	6025	5.42
11	Apr-23	6395	5.76
12	May-23	5296	4.77
13	Total	73496	66.15
14	Maximum	7036	6.33
15	Minimum	5296	4.77
16	Average	6124.67	5.51

Chart No 2: To study the variation of Month wise Energy Consumed, 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 Institute as under:

Table No 3: Computation of Energy Performance Index:

No	Particulars	Value	Unit
1	Annual Energy Purchased	73496	kWh
2	Annual Energy Generated by Solar PV Plant	30000	kWh
3	Total Energy Consumed = **1 + 2**	**103496**	kWh
4	Total Built up area of Institute	**7843.98**	m^2
5	Energy Performance Index = **(3) / (4)**	**13.19**	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 and percentage usage of LED Lighting to total Lighting Load of the Institute.

Table No 4: Computation of Lighting Power density at Room No:

No	Particulars	Value	Unit
1	No of 40 W FTL Fittings in Room	2	Nos
2	Load per Unit of 40 W Fitting	40	Watt
3	Total Load of 40 W FTL Fittings	**80**	W
4	Area of Class Room	57.6	m^2
5	Lighting Power Density = **(3) / (4)**	**2.78**	W/m^2

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

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

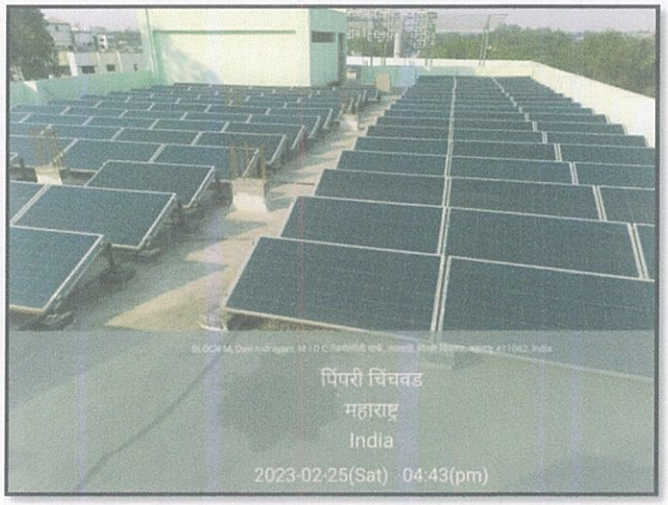
No	Particulars	Value	Unit
1	No of 15 W LED Fittings	453	Nos
2	Load/unit of 15 W LED Fitting	15	W
3	Total Load of 15 W Fittings	**6.795**	kW
4	No of 20 W LED Fittings	395	Nos
5	Load/unit of 20 W LED Fitting	20	W
6	Total Load of 20 W Fittings	**7.9**	kW
7	No of 50 W LED Fittings	15	Nos
8	Load/unit of 50 W LED Fitting	50	W
9	Total Load of 50 W Fittings	**0.75**	kW
10	Total LED Lighting Load=3+6+9	**15.45**	kW
11	Total Lighting Load=3+6+9	**15.45**	kW
12	% of LED to Total Lighting Load =**10*100/11**	**100**	%

CHAPTER-VI
STUDY OF RENEWABLE ENERGY & ENERGY EFFICIENCY

6.1 Usage of Renewable Energy:

The Institute has installed Roof Top Solar PV Plant of Capacity **25 kWp.**

Photograph of Roof Top Solar PV Plant:



6.2 Energy Conservation Project Implemented:

1. Usage of Energy Efficient LED Light Fittings
2. Usage of BEE STAR Rated Equipment
3. Sensor based Operation of Lights

GREEN AUDIT REPORT

of

Kamala Education Society's,

PRATIBHA COLLEGE OF COMMERCE & COMPUTER STUDIES,

Off Mumbai Pune Road, Chinchwad, Pune 411 019

KAMALA
Education Society

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
PUNE

ENGRESS SERVICES

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

Certificate No: ES/PCCCS/22-23/02 **Date: 29/6/2023**

GREEN AUDIT CERTIFICATE

This is to certify that we have conducted Green Audit at Kamala Educational Society's, Pratibha College of Commerce & Computer Studies, Chinchwad, Pune in the year 2022-23.

The College has adopted Energy Efficient & Green Practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of 25 kWp Roof Top Solar PV Plant & Solar Street Lights
- Segregation of Waste at source
- Bio Composting Pit for Conversion of Leafy Waste
- Installation of Rain Water Harvesting Project
- Internal Tree Plantation
- Good Internal Roads
- Provision of Ramp for Divyangajan
- Creation of awareness on Resource Conservation by Display of Posters

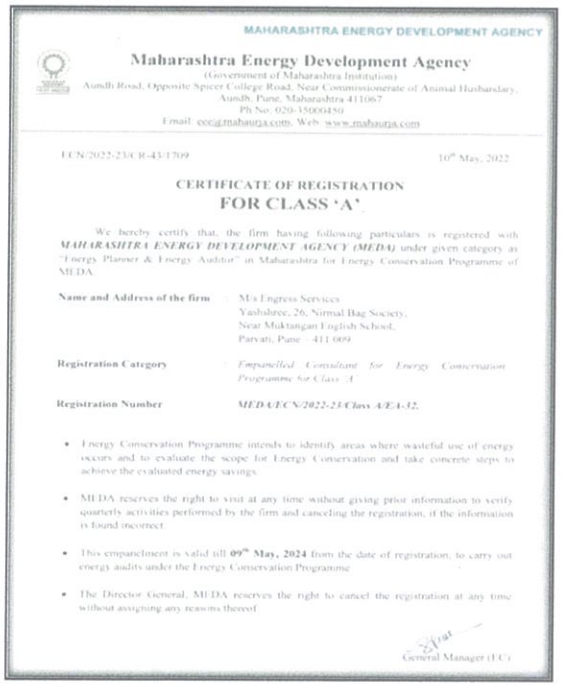
We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

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

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

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

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

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- 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

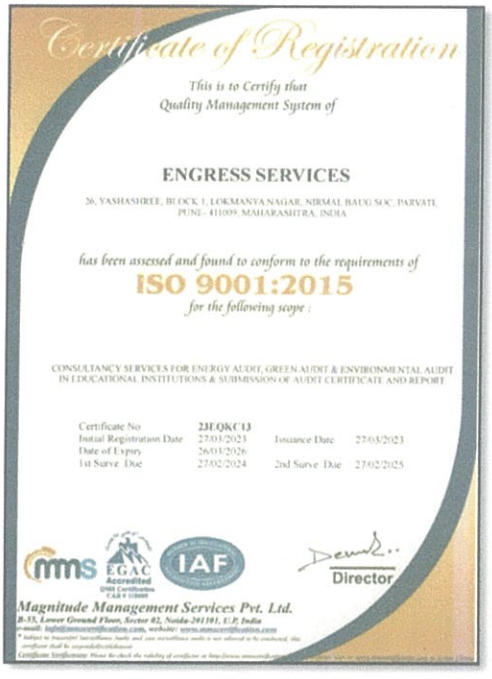
He/she is now eligible to execute the GEM Sustainability Certification Projects.
ASSOCHAM feels proud to award the GEM Certified Professional title to him/her.

Pankaj R. Dharkar
Chairman, GEM

GEM CP 22/788

Deepak Sood
Secretary General, ASSOCHAM

ASSOCHAM GEM CP Certificate



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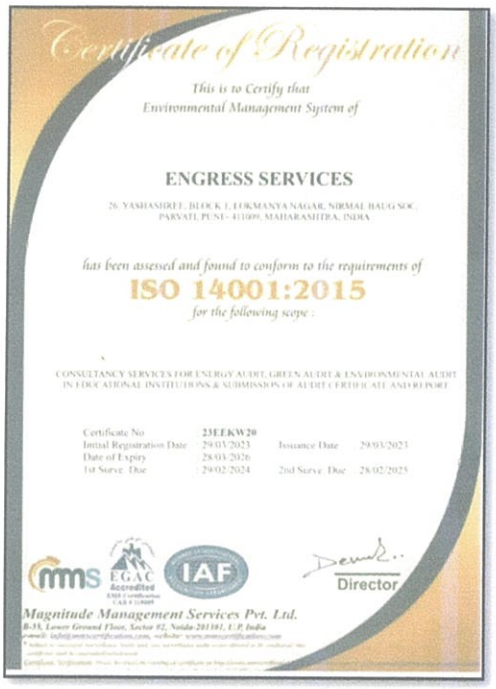
EGAC Accredited QMS Certification CAB # 018005 IAF

Director

Magnitude Management Services Pvt. Ltd.
B-33, Lower Ground Floor, Sector 02, Noida-201301, U.P. India

ISO: 9001-2015 Certificate



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Date of Expiry	28/03/2026		
1st Surve Due	29/02/2024	2nd Surve Due	28/02/2025

EGAC Accredited EMS Certification CAB # 018005 IAF

Director

Magnitude Management Services Pvt. Ltd.
B-33, Lower Ground Floor, Sector 02, Noida-201301, U.P. India

ISO: 14001-2015 Certificate

ENGRESS SERVICES PUNE

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

EXECUTIVE SUMMARY

1. Kamala Education Society's, Pratibha College of Commerce & Computer Studies, 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	Energy Purchased	**73496**	kWh
2	Annual CO_2 Emissions	**66.15**	MT

3. Usage of Renewable Energy & CO_2 Emission Reduction:

- The College has installed Roof Top Solar PV Plant of Capacity **25 kWp.**
- Energy Generated by Solar PV Plant in 22-23 is **30000 kWh**
- Annual Reduction in CO_2 Emissions in 22-23 is **27 MT.**

4. Waste Management:

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

5. Rain Water Harvesting:

The Institute has installed Rain Water Management Project; The Rain Water falling on the terrace and slopes is channelized through a pipe and used to recharge the bore well.

6. Green & Sustainable Practices:

- Well maintained internal road & Tree Plantation
- Provision of Ramp for Divyangajan
- Awareness Creation on Resource Conservation by Display of posters

7. Assumptions:

1. Energy Consumption in computed on the basis of Load Utilization Factor
2. **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
3. **1 kWp** Solar PV system generates **4 kWh** of Electrical Energy per Day
4. Annual Solar Energy Generation Days: **300 Nos**

8. References:

1. For CO_2 Emissions: www.tatapower.com
2. For Solar PV Energy Generation: www.solarrofftop.gov.in

ENGRESS SERVICES PUNE

ABBREVIATIONS

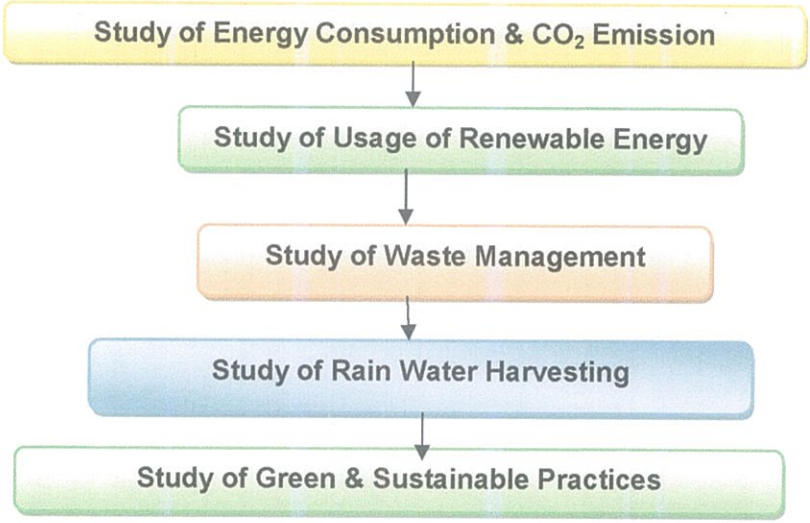
LED	:	Light Emitting Diode
kWh	:	kilo-Watt Hour
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

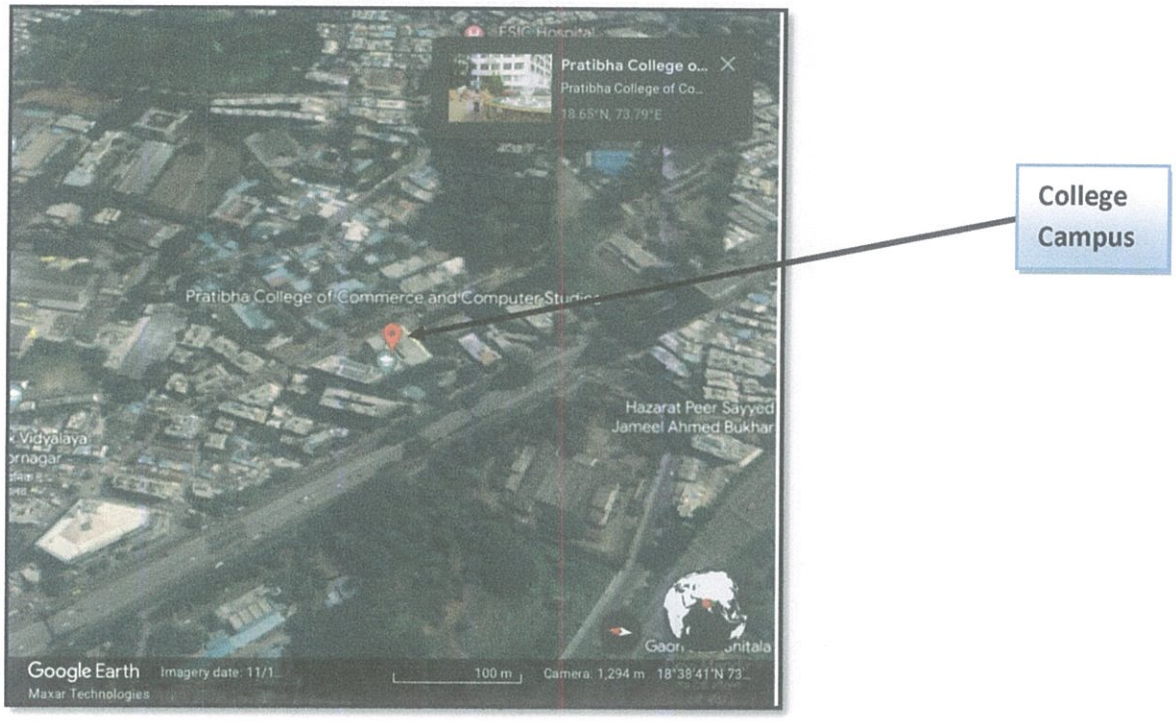
11.1 Introduction:

A Green Audit is conducted at Kamala Education Society's, Pratibha College of Commerce & Computer Studies, Chinchwad, Pune.

1.2 Audit Procedural Steps:



1.3 Institute 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. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the Institute for performing its day to day activities

The Institute uses Electrical Energy for various Electrical gadgets.

Basis for computation of CO_2 Emissions:

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

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the Institute due to its Day to Day operations

Table No 1: Month wise CO_2 Emissions:

No	Month	Energy Purchased, kWh	CO_2 Emissions, MT
1	Jun-22	6325	5.69
2	Jul-22	6179	5.56
3	Aug-22	6036	5.43
4	Sep-22	7036	6.33
5	Oct-22	5935	5.34
6	Nov-22	6127	5.51
7	Dec-22	6110	5.50
8	Jan-23	6096	5.49
9	Feb-23	5936	5.34
10	Mar-23	6025	5.42
11	Apr-23	6395	5.76
12	May-23	5296	4.77
13	Total	73496	66.15
14	Maximum	7036	6.33
15	Minimum	5296	4.77
16	Average	6124.67	5.51

Chart No 1: To study the variation of Month wise Energy Purchased, kWh:

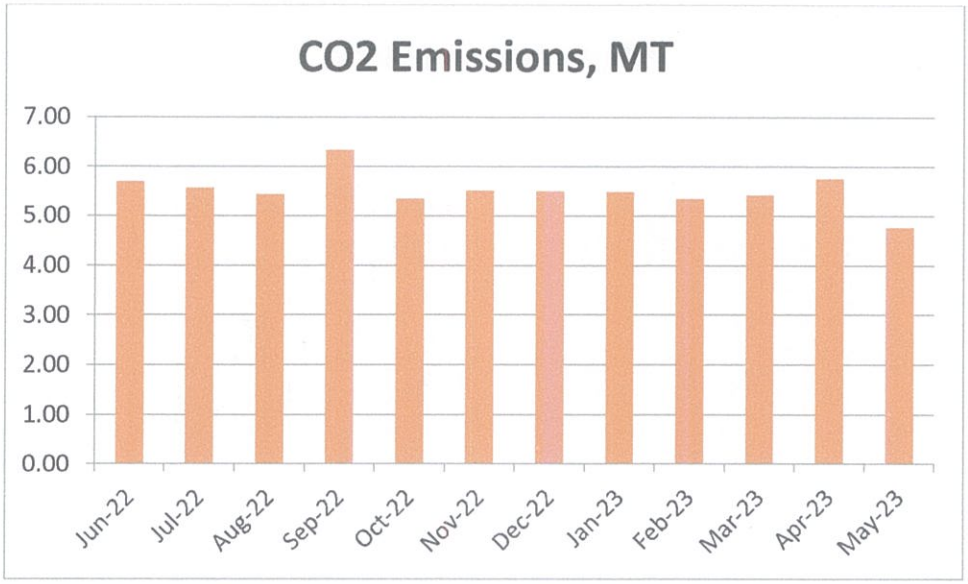


Table No 2: Key Parameters:

No	Parameter	Energy Purchased, kWh	CO_2 Emissions, MT
1	Total	73496	66.15
2	Maximum	7036	6.33
3	Minimum	5296	4.77
4	Average	6124.67	5.51

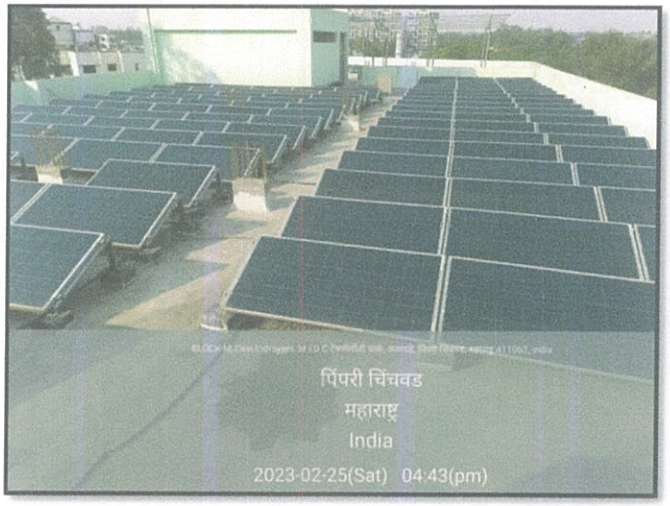
CHAPTER-III
STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed **25 kWp** Roof Top Solar PV Plant. In the following Table, we present the Annual Reduction in CO_2 Emissions due to usage of Renewable Energy.

Table No 3: Calculation of Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Roof Top Solar PV Plant Capacity	25	kWp
2	Average Daily Energy Generated	4	kWh/kWp
3	Annual Generation Days	300	Nos
4	Annual Solar Energy Generated	**30000**	kWh
5	1 kWh of Energy is equivalent to	**0.9**	Kg of CO_2
6	Reduction in Annual CO_2 Emissions= **(4) * (5)/1000**	**27**	**MT**

Photograph of Roof Top Solar PV Plant:



CHAPTER IV
STUDY OF WASTE MANAGEMENT

4.1 Segregation of Waste at Source

The Waste is segregated at source. Waste Collection Bins are placed at various locations.

Photograph of Waste Collection Bin:

4.2 Organic Waste Management:

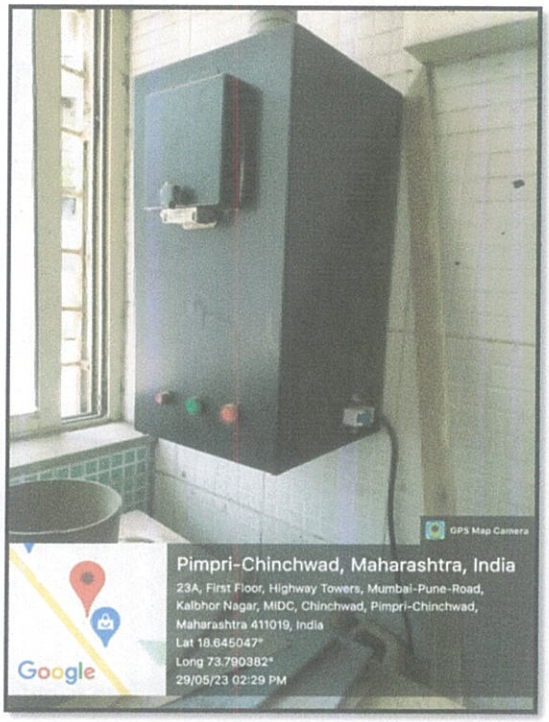
A Bio Composting Pit is used to convert the Leafy Waste into Bio Compost.

Photograph of Bio Composting Arrangement:

4.3 Sanitary Waste Management:

The Institute has installed Sanitary Waste Incinerator, to dispose of the Sanitary Waste.

Photograph of Sanitary Waste Incinerator:



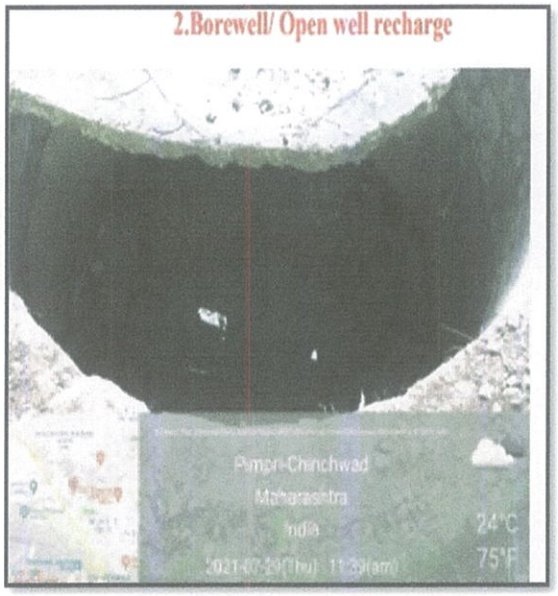
4.4 E Waste Management:

The E Waste is disposed of through Authorized Agency.

CHAPTER-V
STUDY OF RAIN WATER MANAGEMENT

The Institute has installed Rain Water Management Project; The Rain Water falling on the terrace and slopes is channelized through a pipe and used to recharge the bore well .

Photograph of Bore well Recharge Point:

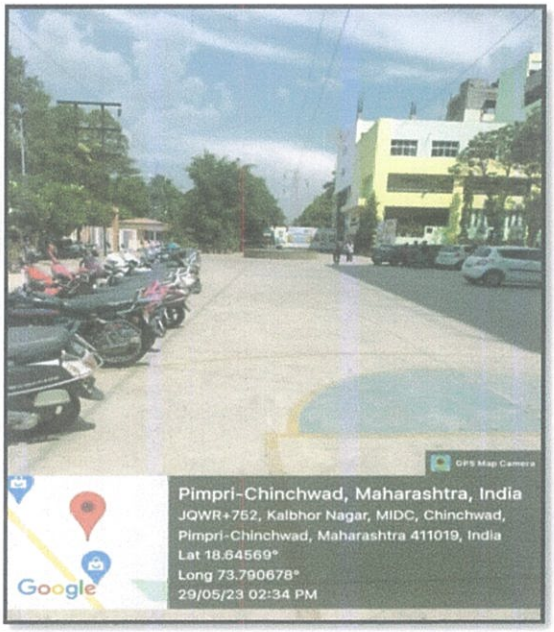


CHAPTER-VI
STUDY OF GREEN & SUSTAINABLE PRACTICES

6.1 Pedestrian Friendly Internal Road:

The College has well maintained internal roads to facilitate the easy movement of the students within the campus.

Photograph of Internal Road:



6.2 Internal Tree Plantation:

The College has beautiful maintained lawn and tree plantation in the campus.

Photograph of Tree Plantation in the campus:

6.3 Provision of Ramp for Divyangajan:

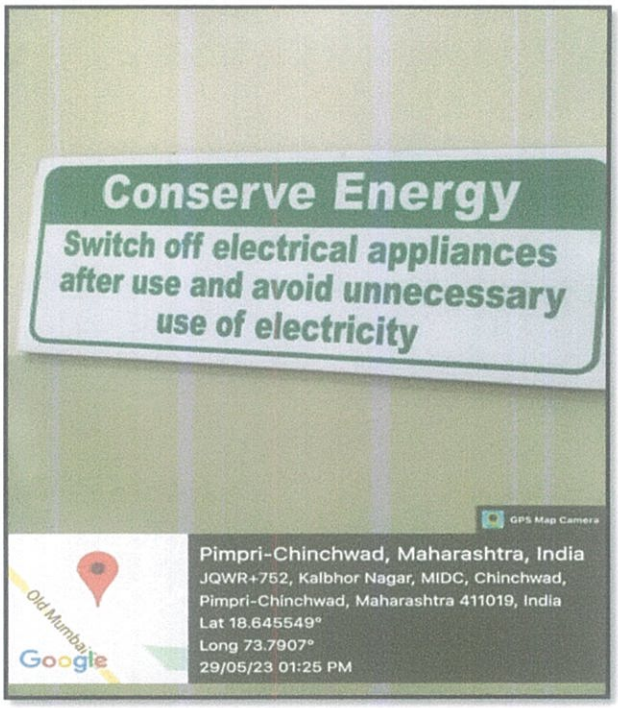
The College has made provision of Ramp for Divyangajan.

Photograph of Ramp:

6.4 Creation of Awareness about Resource Conservation:

The College has displayed Posters on Importance of Energy Conservation.

Photograph of Posters on Resource Conservation:



ANNEXURE

DETAILS OF TREES AND PLANTS IN THE CAMPUS:

No	Name of Tree/Plant
1	Cycus
2	Adulsa
3	Bottle Brush
4	Green Champa
5	Ashwagandha
6	Dikemali
7	Bel
8	Tulsi
9	Shevga
10	Seeta Ashok
11	Tuti
12	Apta
13	Bibba
14	Tamhan
15	Sonchampa
16	Kanher
17	Amla
18	Behda
19	Arjun
20	Mahogany
21	Ritha
22	Rose
23	Shikekai
24	Mehendi
25	Bramhi
26	Gulvel
27	Jasmine
28	Jai
29	Shatavari
30	Gingko
31	Tirphal
32	Nagkeshar
33	Bhringaraj
34	Putrajeevi
35	Madhumalti

No	Indoor Plants Name of Tree/Plant
1	Peace Lily
2	Aloevera
3	Drecena
4	Fern
5	Chinese Evergreen
6	Flemingo
7	Arica Palm
8	Money Plant
9	Heart Leaf
10	Azalia
11	Green Spider
12	Weeping Fig
13	Croton
14	Fig Plant
15	Dumb cane
16	Snake plant

ENVIRONMENTAL AUDIT REPORT

of

Kamala Education Society's,

PRATIBHA COLLEGE OF COMMERCE & COMPUTER STUDIES,

Off Mumbai Pune Road, Chinchwad, Pune 411 019

KAMALA
Education Society

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
PUNE

ENGRESS SERVICES

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

Certificate No: ES/PCCCS/22-23/03 **Date: 29/6/2023**

ENVIRONMENTAL AUDIT CERTIFICATE

This is to certify that we have conducted Environmental Audit at Kamala Educational Society's, Pratibha College of Commerce & Computer Studies, Chinchwad, Pune in the year 2022-23.

The College has adopted Environment Friendly Practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of 25 kWp Roof Top Solar PV Plant & Solar Street Lights
- Segregation of Waste at source
- Bio Composting Pit for Conversion of Leafy Waste
- Installation of Rain Water Harvesting Project
- Internal Tree Plantation
- Creation of awareness on Resource Conservation by Display of Posters

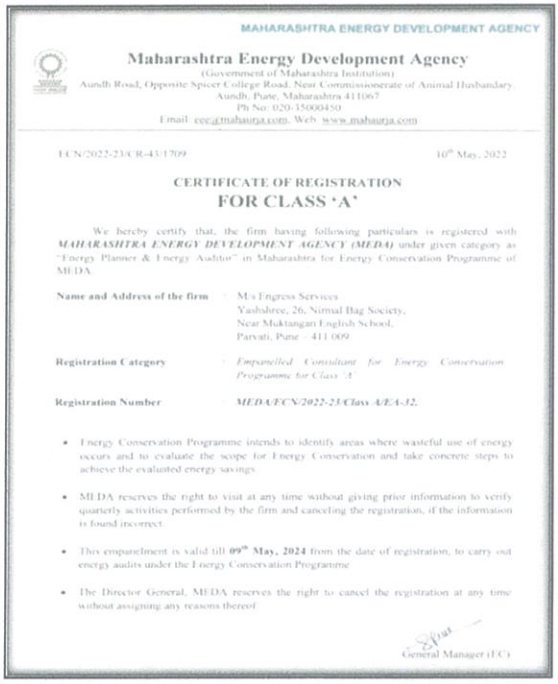
We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation& making the campus Energy Efficient, Green and Environment Friendly.

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: 020-35600450
Email: eec@mahaurja.com, Web: www.mahaurja.com

EEN/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 (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

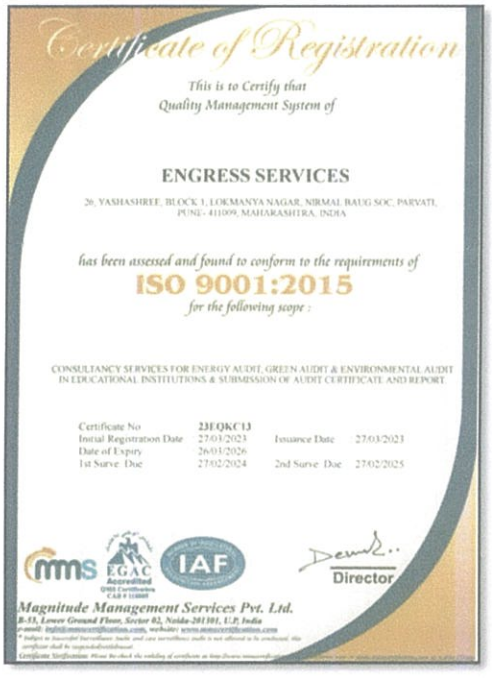
He/she is now eligible to execute the GEM Sustainability Certification Projects.
ASSOCHAM feels proud to award the GEM Certified Professional title to him/her.

Pankaj R. Dharkar
Chairman, GEM

GEM CP 22/788

Deepak Sood
Secretary General, ASSOCHAM

ASSOCHAM GEM CP Certificate



Certificate of Registration

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.

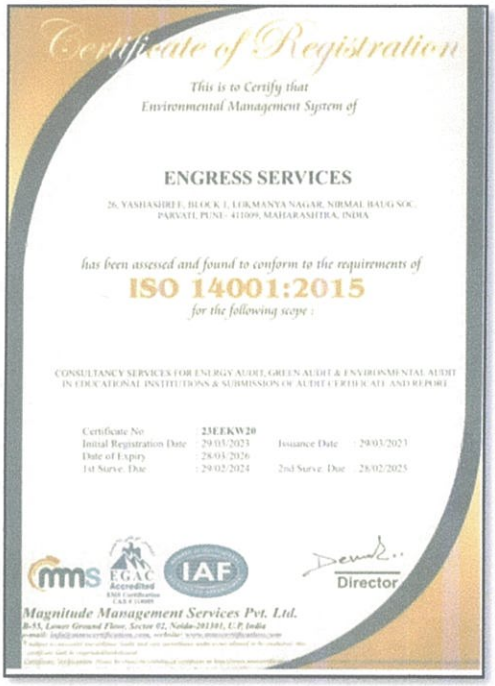
Certificate No	23EQKC13		
Initial Registration Date	27/03/2023	Issuance Date	27/03/2023
Date of Expiry	26/03/2026		
1st Surve. Due	27/02/2024	2nd Surve. Due	27/02/2025

mms EGAC Accredited IAF

Director

Magnitude Management Services Pvt. Ltd.
B-53, Lower Ground Floor, Sector 02, Noida-201301, U.P. India

ISO: 9001-2015 Certificate



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mms EGAC Accredited IAF

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B-53, Lower Ground Floor, Sector 02, Noida-201301, U.P. India

ISO: 14001-2015 Certificate

ENGRESS SERVICES PUNE

INDEX

ACKNOWLEDGEMENT

We at Engress Services, Pune, express our sincere gratitude to the management of Kamala Education Society's, Pratibha College of Commerce & Computer Studies, Pune for awarding us the assignment of Environmental Audit of their campus for the Year: 2022-23.

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

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EXECUTIVE SUMMARY

1. Kamala Education Society's, Pratibha College of Commerce & Computer Studies, Pune consumes Energy in the form of **Electrical Energy;** used for various gadgets, Office & other facilities.

2. Pollution caused due to College Activities:

- **Air pollution:** Mainly CO_2 on account of Electricity Consumption
- **Solid Waste:** Bio degradable Garden Waste, Recyclable Waste and Human Waste
- **Liquid Waste:** Human & Laboratory Liquid waste

3. Present Energy Consumption & CO_2 Emission:

No	Particulars	Value	Unit
1	Energy Purchased	**73496**	kWh
2	Annual CO_2 Emissions	**66.15**	MT

4. Various projects implemented for Environmental Conservation:

- Usage of Energy Efficient BEE STAR Rated Equipment
- Installation of 25 kWp Roof Top Solar PV Plant
- Installation of Rain Water Harvesting Plant

5. Usage of Renewable Energy & CO_2 Emission Reduction:

- The College has installed Roof Top Solar PV Plant of Capacity **25 kWp.**
- Energy Generated by Solar PV Plant in 22-23 is **30000 kWh**
- Annual Reduction in CO_2 Emissions in 22-23 is **27 MT.**

6. Indoor Air Quality:

No	Parameter/Value	AQI	PM2.5	PM10
1	Maximum	**92**	**55**	**69**
2	Minimum	**84**	**50**	**62**

7. Indoor Comfort Condition Parameters:

No	Parameter/Value	Temperature, ^0C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	**29.4**	**48**	**190**	**45**
2	Minimum	**29.3**	**47**	**109**	**41**

8. Waste Management:

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

9. Rain Water Harvesting:

The Institute has installed Rain Water Management Project; The Rain Water falling on the terrace and slopes is channelized through a pipe and used to recharge the bore well.

10. Environment Friendly Initiatives:

- Internal tree Plantation.
- Creation of Awareness on Resource Conservation by Display of Posters

11. Assumptions:

1. 1 kWh of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
2. **1 kWp** Solar PV system generates **4 kWh** of Electrical Energy per Day
3. Annual Solar Energy Generation Days: **300 Nos**

12. References:

- For CO_2 Emission computation: 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

kWh	:	kilo-Watt Hour
Qty	:	Quantity
MT	:	Metric Ton
CO_2	:	Carbon Di Oxide
kWp	:	Kilo Watt Peak
AQI	:	Air Quality Index
PM2.5	:	Particulate Matter of Size 2.5 microns
PM 10	:	Particulate Matter of Size 10 microns
CPCB	:	Central Pollution Control Board
ISHARE	:	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:

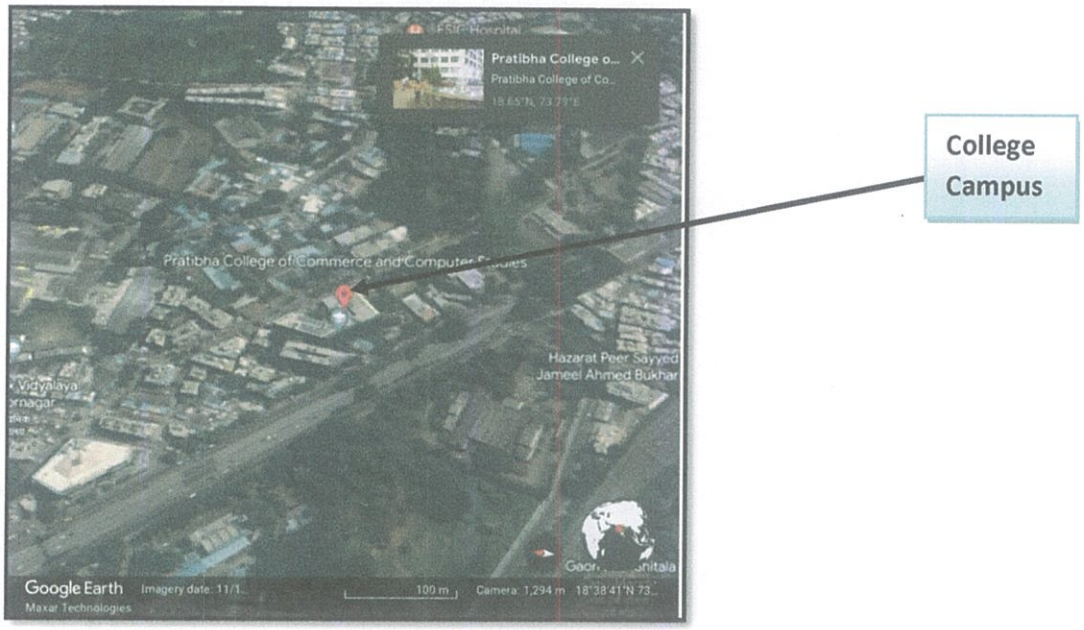
An audit which aims at verification and validation to ensure that various environmental laws are compiled with and adequate care has been taken towards environmental protection and preservation

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:

1.5 Institute Location Image:



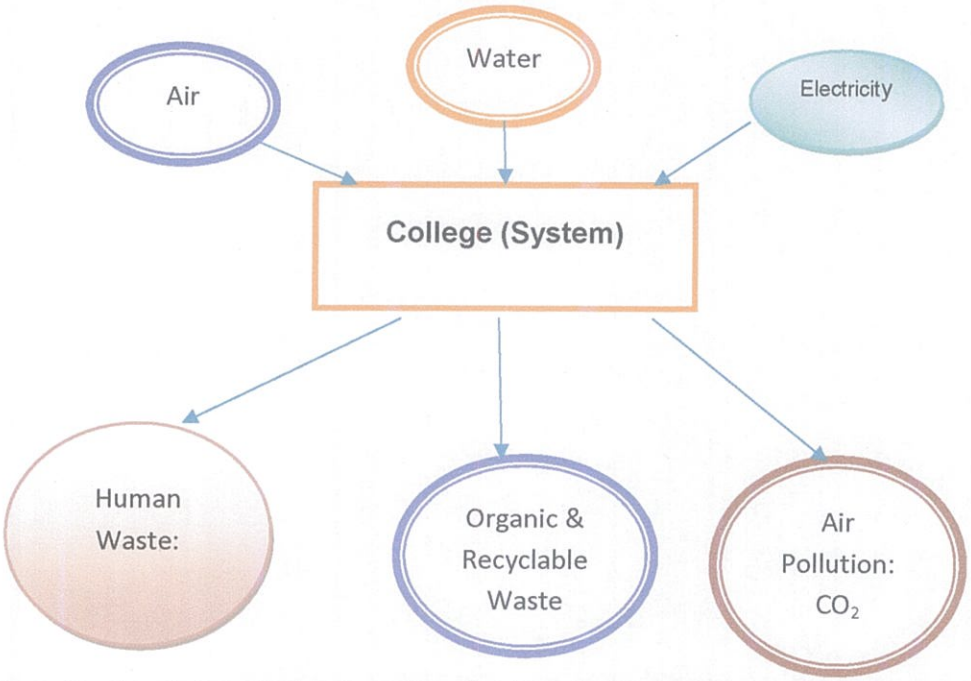
CHAPTER-II
STUDY OF RESOURCE CONSUMPTION & CO_2 EMISSION

The College consumes following Natural/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:



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The basis of Calculation for CO_2 emissions due to Electrical Energy is:

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

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13	Total	73496	66.15
14	Maximum	7036	6.33
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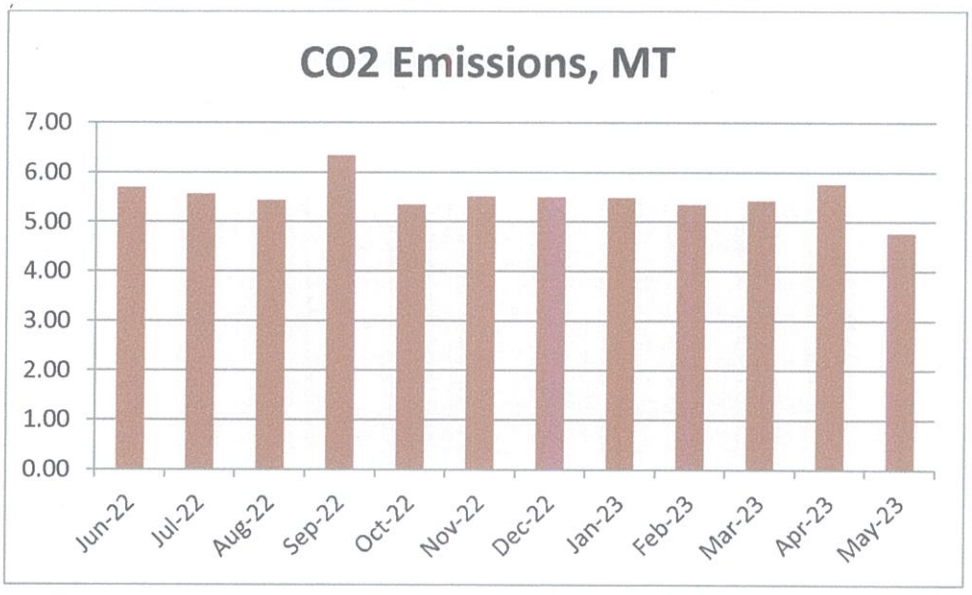
16	Average	6124.67	5.51

Chart No 2: Representation of Month wise CO_2 emissions:



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CHAPTER-III
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The College has installed **25 kWp** Roof Top Solar PV Plant. In the following Table, we present the Annual Reduction in CO_2 Emissions due to usage of Renewable Energy.

Table No 3: Calculation of Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Roof Top Solar PV Plant Capacity	25	kWp
2	Average Daily Energy Generated	4	kWh/kWp
3	Annual Generation Days	300	Nos
4	Annual Solar Energy Generated	**30000**	kWh
5	1 kWh of Energy is equivalent to	**0.9**	Kg of CO_2
6	Reduction in Annual CO_2 Emissions= **(4) * (5)/1000**	**27**	**MT**

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 liveability.

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. As the AQI increases, it means that a large percentage of the population will experience severe adverse health effects.
We present herewith following important Parameters.

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

Table No 4: Indoor Air Quality Parameters:

No	Location	AQI	PM-2.5	PM-10
	Ground Floor			
1	Computer Lab	91	55	67
2	Language Lab	85	50	63
	First Floor			
3	Library	90	54	69
4	TYBCA	84	51	62
	Second Floor			
5	Electronics Lab	91	53	67
6	Classroom	92	54	67
	Third Floor			
7	Staffroom	86	51	64
8	Bio Lab	91	55	66
	Maximum	**92**	**55**	**69**
	Minimum	**84**	**50**	**62**

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 5: Study of Indoor Comfort Parameters:

No	Location	Temperature, ^{0}C	Humidity, %	Lux Level	Noise Level, dB
	First Floor				
1	Library	29.4	47	131	41
2	SYMCA	29.4	48	109	42.3
	Second Floor				
3	Classroom	29.3	48	117	44
4	Computer Lab	29.4	48	159	44.9
	Third Floor				
5	Physics Lab	29.3	47	156	45
6	IQAC Room	29.3	48	190	42.6
	Fourth Floor				
7	Chemistry Lab	29.4	47	142	43.8
8	Classroom	29.3	47	120	41.9
	Maximum	**29.4**	**48**	**190**	**45**
	Minimum	**29.3**	**47**	**109**	**41**

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 and separate Waste Collection Bins are placed for collection of Dry & Wet Waste.

Photograph of Waste Collection Bin:

6.2 Organic Waste Management:

A Bio Composting Pit is used to convert the Leafy Waste into Bio Compost.

Photograph of Bio Composting Arrangement:

ENGRESS SERVICES PUNE

6.3 Sanitary Waste Management:

The Institute has installed Sanitary Waste Incinerator, to dispose of the Sanitary Waste.

Photograph of Sanitary Waste Incinerator:

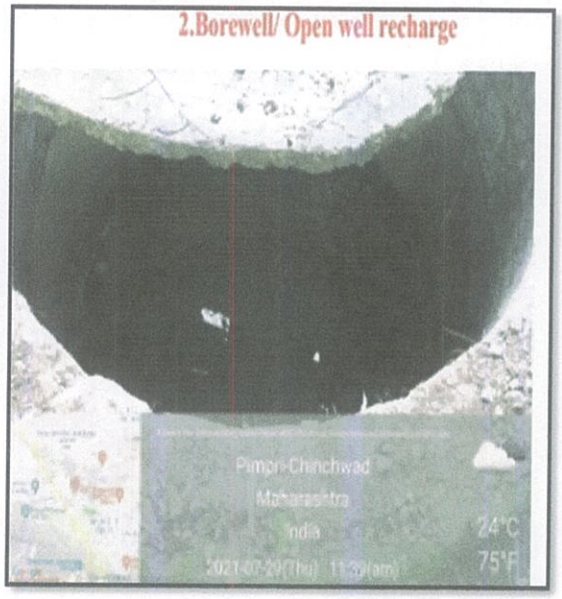
6.4 E Waste Management:

The E Waste is disposed of through Authorized Agency.

CHAPTER-VII
STUDY OF RAIN WATER MANAGEMENT

The Institute has installed Rain Water Management Project; The Rain Water falling on the terrace and slopes is channelized through a pipe and used to recharge the bore well.

Photograph of Bore well Recharge Point:



CHAPTER-VIII
STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

8.1 Internal Tree Plantation:

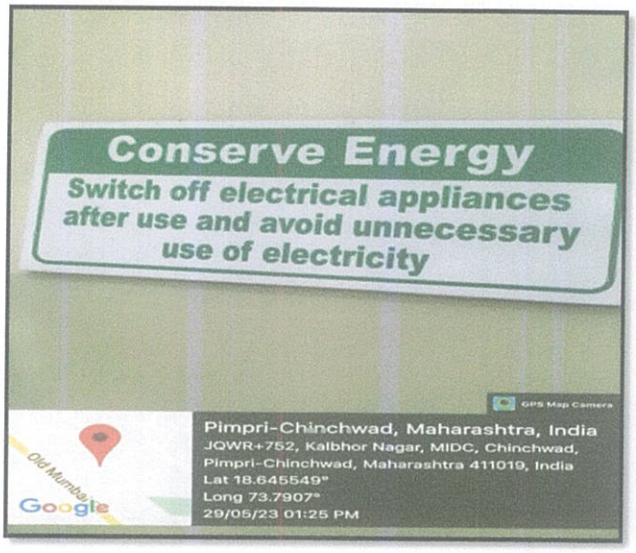
The College has beautiful maintained Tree plantation in the campus.

Photograph of Tree Plantation in the campus:

8.2 Creation of Awareness about Resource Conservation:

The College has displayed Posters on Importance of Energy Conservation.

Photograph of Posters on Resource Conservation:



ANNEXURE:
AIR QUALITY, NOISE & INDOOR COMFORT STANDARDS:

1. Category Wise Air Quality Index Values & Concentration of PM-2.5 & PM-10:

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%