

ENGRESS SERVICES

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

INVOICE

To The Principal, Nutan Maharashtra Vidya Prasarak Mandal's, Nutan Maharashtra Institute of Engineering & Technology, Vishnupuri, Talegaon Dabhade, Pune 410 507	Invoice No: 2023-24/77 Date: 3/8/2023
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Work Order No	
Our PAN No	AMOPM6853B

No	Particulars	Charges per Unit, Rs.	Quantity Nos.	Amount in Rs.
1	Consultancy Service Charges for Energy, Green & Environmental Audit Reports of your Campus: Years: 21-22 & 22-23	7500.00	02	15000.00
2	Total Amount			15000.00
3	Amount in Words: Rupees Fifteen Thousand only.			

For Engress Services,

Ameherdale

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



ENERGY AUDIT REPORT

of

Nutan Maharashtra Vidya Prasarak Mandal's,
**NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING &
TECHNOLOGY, PUNE,**

Vishnupuri, Talegaon Dabhade, Pune 410 507



Year: 2022-23

Prepared by:

ENGRESS SERVICES

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ENGRESS SERVICES

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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/NMIET/22-23/01

Date: 31/7/2023

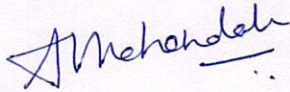
This is to certify that we have conducted an Energy Audit at Nutan Maharashtra Vidya Prasarak Mandal's Nutan Maharashtra Institute of Engineering & Technology Pune, Vishnupuri, Talegaon Dabhade, Pune, in the Year 2022-23.

The Institute has adopted following Energy Efficient Practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of Solar Thermal Water Heating System at Hostel Block
- 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 Energy Conservation.

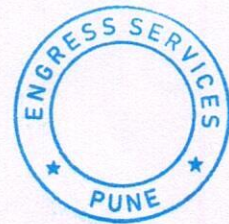
For Engress Services,



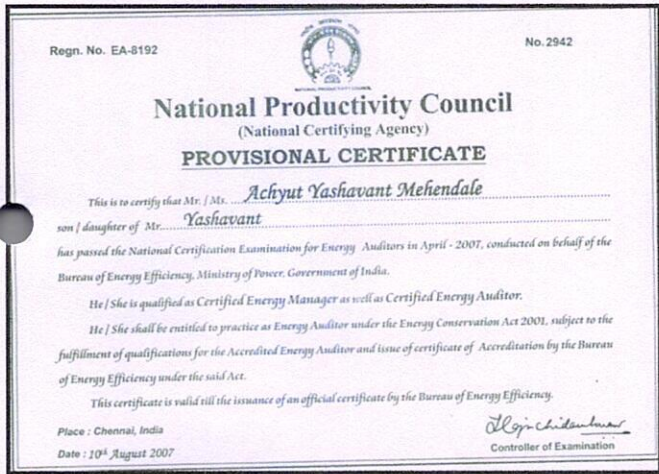
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B E-Mechanical, M Tech- Energy

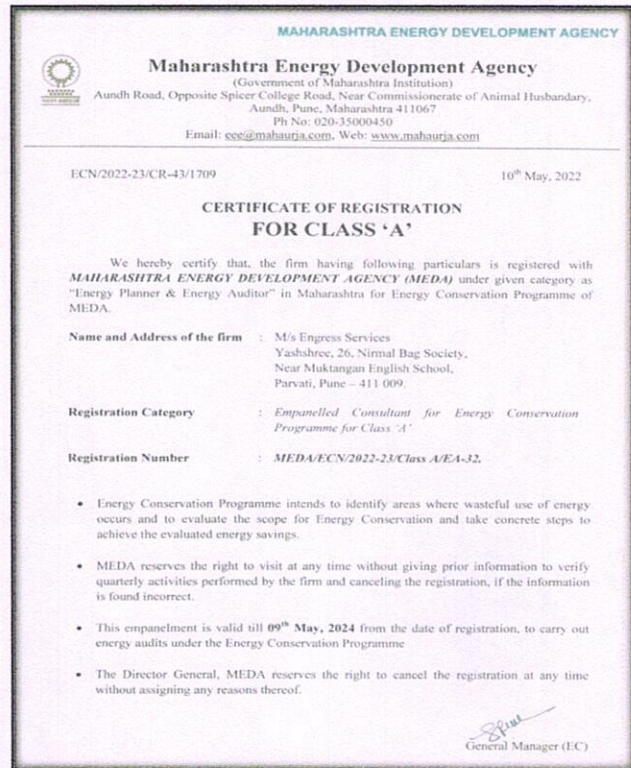
BEE Certified Energy Auditor, EA-8192



REGISTRATION CERTIFICATES



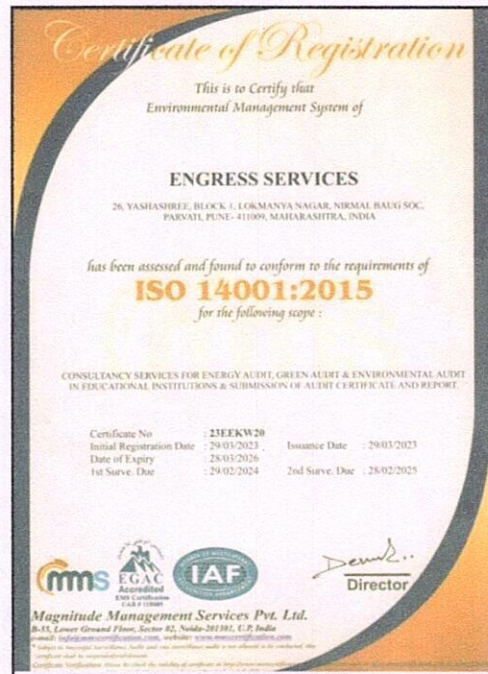
BEE AUDITOR CERTIFICATE



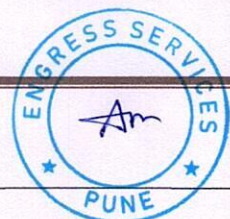
MEDA REGISTRATION CERTIFICATE



ISO: 9001-2015 CERTIFICATE



ISO: 14001-2015 CERTIFICATE



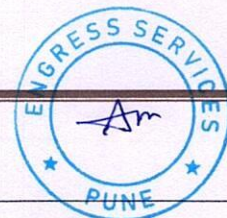
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ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Nutan Maharashtra Vidya Prasarak Mandal's Nutan Maharashtra Institute of Engineering & Technology Pune, Vishnupuri, Talegaon Dabhade, Pune, for awarding us the assignment of Energy Audit of their Talegaon Dabhade Campus for the Year: 2022-23.

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



EXECUTIVE SUMMARY

1. Nutan Maharashtra Vidya Prasarak Mandal's Nutan Maharashtra Institute of Engineering & Technology Pune, Vishnupuri, Talegaon Dabhade, Pune consumes Energy in the form of **Electrical Energy**; used for various Electrical Equipment.

2. Present Connected Load & Energy Consumption:

No	Particulars	Value	Unit
1	Total Connected Load	184	kW
2	Annual Energy Purchased	152679	kWh

3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Purchased	152679	kWh
2	Annual Energy Generated	30000	kWh
3	Annual Energy Consumed =1 +2	182679	kWh
4	Total Built up area of Institute	11713.55	m ²
5	Energy Performance Index =(3) / (4)	15.60	kWh/m ²

4. Study of % Usage of LED Lighting:

No	Particulars	Value	Unit
1	% of Usage of LED Lighting to Total Lighting Load	20.76	%

5. Renewable Energy & Energy Efficiency Projects:

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

6. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg** of CO₂ 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 CO₂ 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
MEDA	:	Maharashtra Energy Development Agency
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO ₂	:	Carbon Di Oxide
MT	:	Metric Ton

CHAPTER-I INTRODUCTION

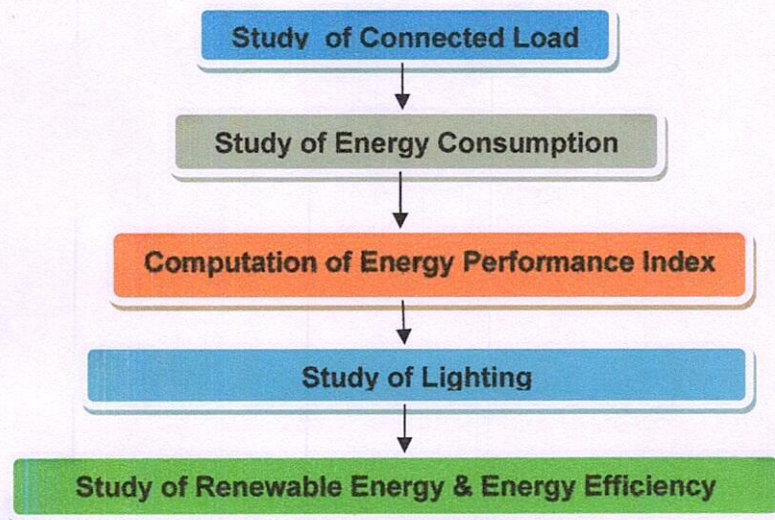
1.1 Introduction:

An Energy Audit is conducted at Nutan Maharashtra Vidya Prasarak Mandal's Nutan Maharashtra Institute of Engineering & Technology Pune.

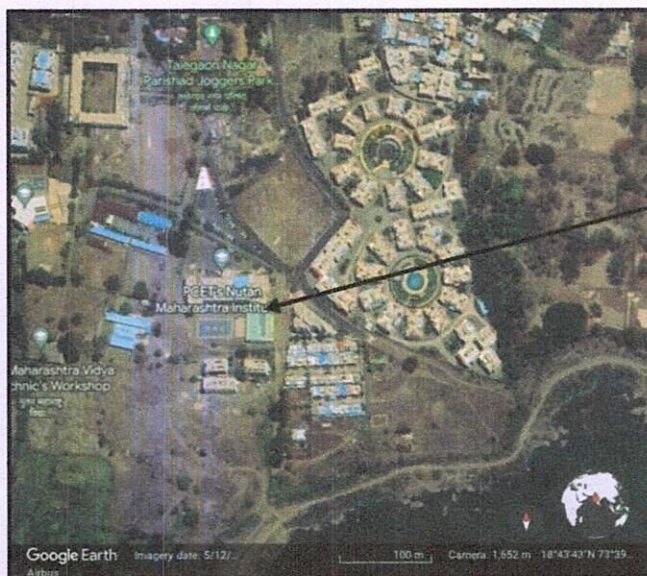
The guidelines followed for conducting the Energy Audit are:

- 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 Google Earth Location Image:



Institute
Campus

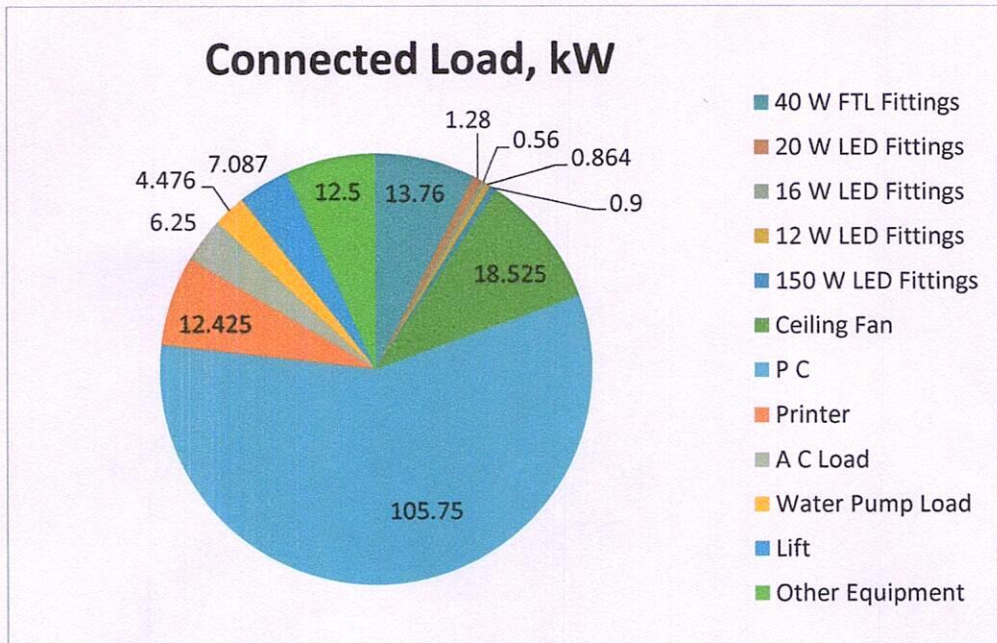
CHAPTER-II STUDY OF CONNECTED LOAD

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 Fittings	344	40	13.76
2	20 W LED Fittings	64	20	1.28
3	16 W LED Fittings	35	16	0.56
4	12 W LED Fittings	72	12	0.864
5	150 W LED Fittings	6	150	0.9
6	Ceiling Fan	285	65	18.525
7	P C	705	150	105.75
8	Printer	71	175	12.425
9	A C Load	5	1250	6.25
10	Water Pump Load	2	2238	4.476
11	Lift	1	7087	7.087
12	Other Equipment	50	250	12.5
13	Total			184

Chart No 1: Study of Connected Load:



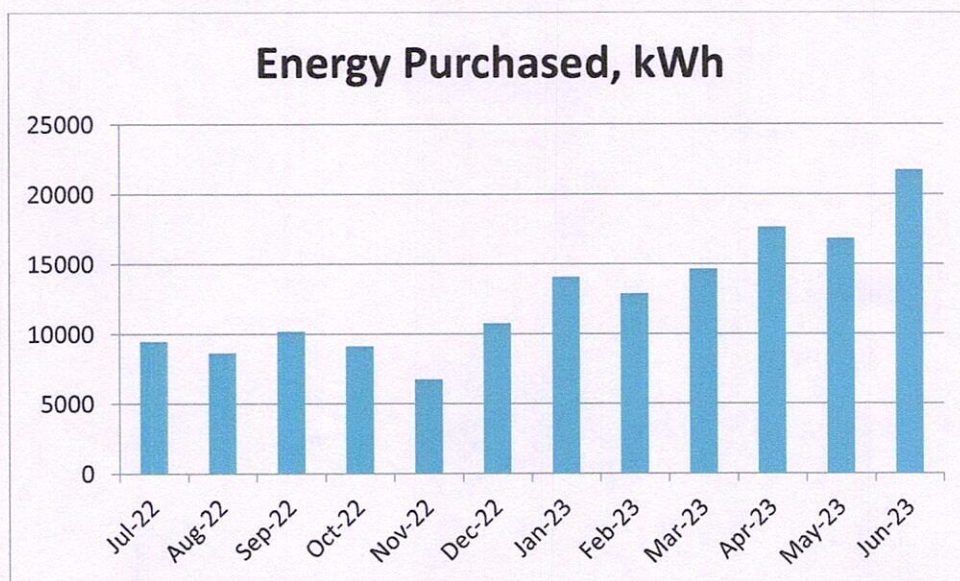
CHAPTER-III STUDY OF PRESENT ENERGY CONSUMPTION

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	Jul-22	9477	8.53
2	Aug-22	8644	7.78
3	Sep-22	10174	9.16
4	Oct-22	9117	8.21
5	Nov-22	6739	6.07
6	Dec-22	10765	9.69
7	Jan-23	14058	12.65
8	Feb-23	12873	11.59
9	Mar-23	14615	13.15
10	Apr-23	17630	15.87
11	May-23	16837	15.15
12	Jun-23	21750	19.58
13	Total	152679	137.41
14	Maximum	21750	19.58
15	Minimum	6739	6.07
16	Average	12723.25	11.45

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:

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

Now we compute the EPI for the Institute as under:

Table No 3: Computation of Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Purchased	152679	kWh
2	Energy Generated by Solar PV Plant	30000	kWh
3	Total Energy Consumed= 1+2	182679	kWh
4	Total Built up area of Institute	11713.55	m ²
5	Energy Performance Index =(3) / (4)	15.60	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 usage of LED Lighting to Total Lighting Load, as under.

Table No 4: Percentage Usage of LED Lighting to Total Lighting Load:

No	Particulars	Value	Unit
1	No of 40 W FTL Fittings	344	Nos
2	Load/Unit of 40 W FTL Fitting	40	W/unit
3	Total Load of 40 W FTL Fitting	13.76	kW
4	No of 20 W LED Fittings	64	Nos
5	Load/Unit of 20 W LEDL Fitting	20	W/unit
6	Total Load of 20 W LED Fitting	1.28	kW

7	No of 16 W LED Fittings	35	Nos
8	Load/Unit of 16 W LEDL Fitting	16	W/unit
9	Total Load of 16 W LED Fitting	0.56	kW
10	No of 12 W LED Fittings	72	Nos
11	Load/Unit of 12 W LEDL Fitting	12	W/unit
12	Total Load of 12 W LED Fitting	0.864	kW
13	No of 150 W LED Fittings	6	Nos
14	Load/Unit of 150 W LEDL Fitting	150	W/unit
15	Total Load of 150 W LED Fitting	0.9	kW
16	Total LED Lighting Load=6+9+12+15	3.60	kW
17	Total Lighting Load= 3+6+9+12+15	17.36	kW
18	% of LED to Total Lighting Load= $16 \times 100 / 17$	20.76	%

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**

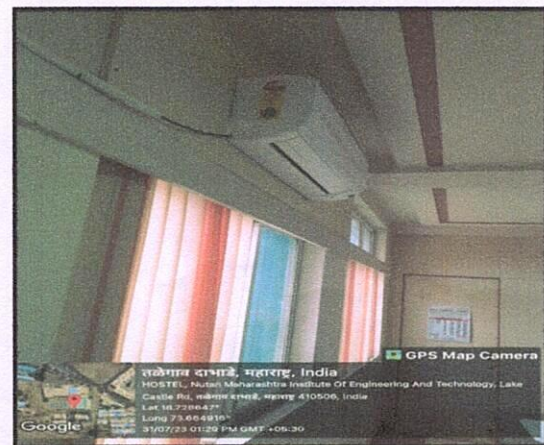
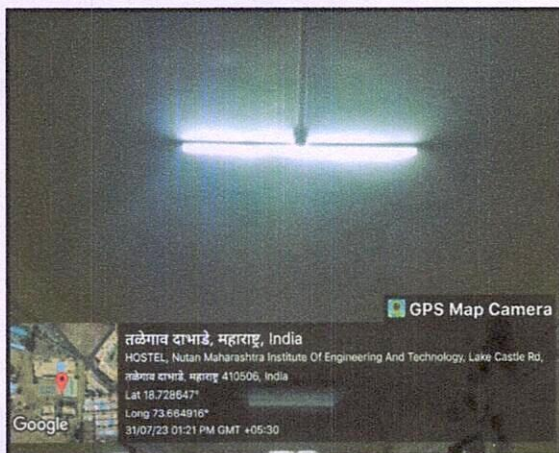
Photograph of Roof Top Solar PV Plant:



6.2 Energy Efficiency Measures adopted:

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

Photographs of STAR Rated AC & LED Lighting:



GREEN AUDIT REPORT

of

Nutan Maharashtra Vidya Prasarak Mandal's,
**NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING &
TECHNOLOGY, PUNE,**

Vishnupuri, Talegaon Dabhade, Pune 410 507



Year: 2022-23

Prepared by:

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/NMIET/22-23/02

Date: 31/7/2023

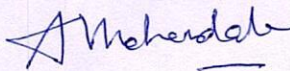
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The Institute has adopted following Green & Sustainable Practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of Solar Thermal Water Heating System at Hostel Block
- Installation of 25 kWp Roof Top Solar PV Plant
- Segregation of Waste at source
- Implementation of Rain Water Management Project
- Good Internal Road
- Internal Tree Plantation
- Provision of Ramp for Divyangajan
- Creation of awareness about Water Conservation by Display of Posters

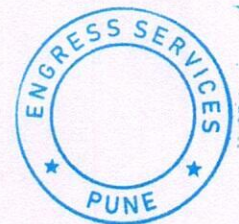
We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

For Engress Services,

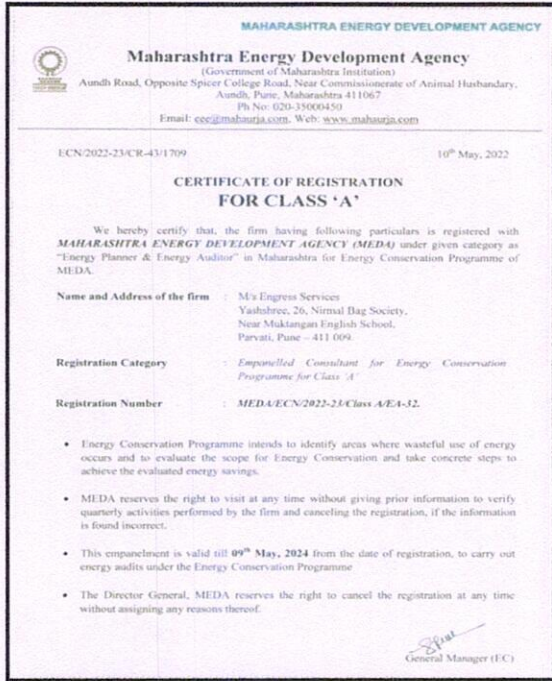


A Y Mehendale,

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



REGISTRATION CERTIFICATES

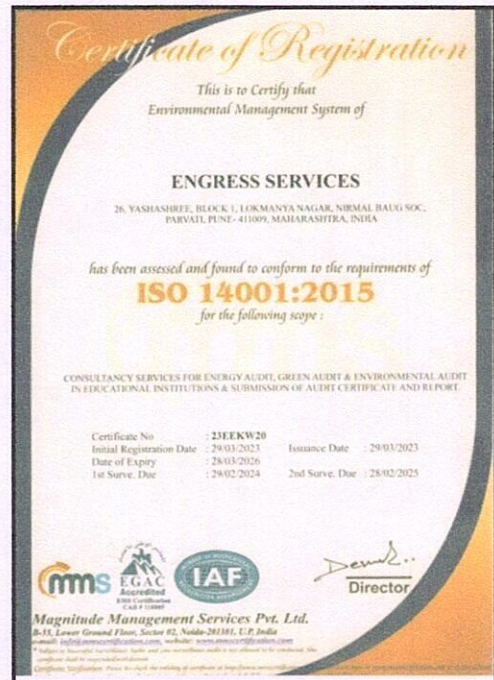


MEDA Registration Certificate

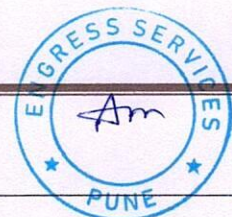
GEM Certified Professional Certificate



ISO: 9001-2015 Certificate



ISO: 14001-2015 Certificate



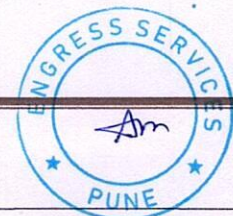
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4	Study of Waste Management	11
5	Study of Rain water Harvesting	12
6	Study of Green & Sustainable Practices	13
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ACKNOWLEDGEMENT

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2. Present Energy Consumption & CO₂ Emission:

No	Particulars	Value	Unit
1	Annual Energy Purchased	152679	kWh
2	Annual CO ₂ Emissions	137.41	MT

3. Renewable Energy & Reduction in CO₂ Emissions:

No	Particulars	Value	Unit
1	Solar PV Installed Capacity	25	kWp
2	Energy Generated in 2022-23	30000	kWp
3	Annual Reduction in CO ₂ Emissions	27	MT

4. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Recommended to Convert in a Bio Composting Bed
3	Sanitary Waste	Recommended to dispose in Sanitary Waste Incinerator
4	E Waste Management	Recommended to dispose of through Authorized Agency

5. Rain Water Harvesting:

The Institute has installed Pipes from the terrace and the Rain water falling on the terrace is used to increase the underground Water Table.

6. Green & Sustainable Practices:

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

7. Assumptions:

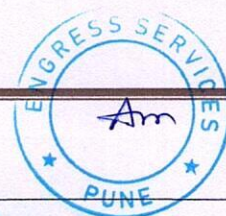
1. **1 kWh** of Electrical Energy releases **0.9 Kg** of CO₂ into atmosphere
2. Energy generated by Roof Top Solar PV Plant: **4 kWh/kWp per Day**
3. Annual Solar Energy generation Days: **300 Nos**

8. References:

- For CO₂ Emissions: www.tatapower.com
- For Solar PV Energy generation: www.solarrooftop.gov.in

ABBREVIATIONS

BEE	Bureau of Energy Efficiency
kWh	Kilo Watt Hour
LPD	Liters Per Day
Kg	Kilo Gram
MT	Metric Ton
CO ₂	Carbon Di Oxide
Qty	Quantity

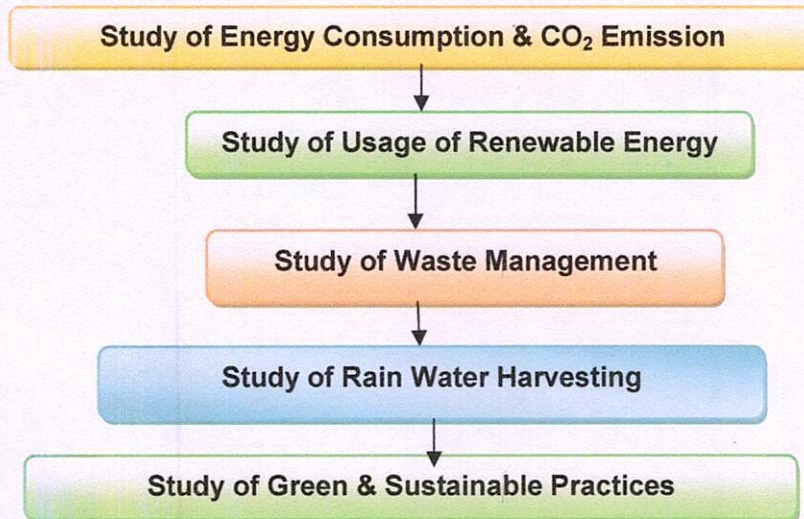


CHAPTER-I INTRODUCTION

1.1 Introduction:

A Green Audit is conducted at Nutan Maharashtra Vidya Prasarak Mandal's Nutan Maharashtra Institute of Engineering & Technology Pune.

1.2 Audit Procedural Steps:



1.3 Institute Location Image:



CHAPTER-II

STUDY OF ENERGY CONSUMPTION & CO₂ EMISSION

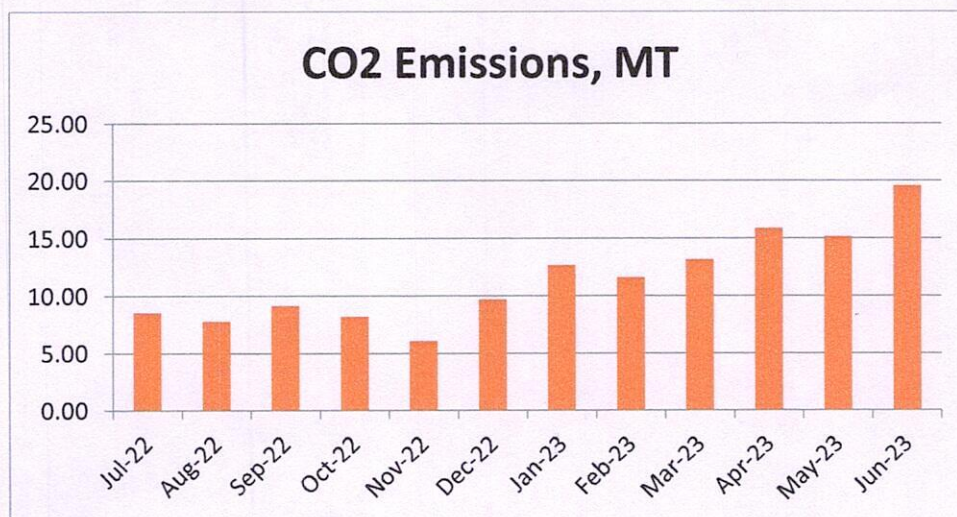
A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the Institute for performing its day to day activities

Basis for computation of CO₂ Emissions: The basis of Calculation for CO₂ emissions due to Electrical Energy is: **1 kWh** of Electrical Energy releases **0.9 Kg of CO₂** into atmosphere

Table No 1: Month wise CO₂ Emissions:

No	Month	Energy Purchased, kWh	CO ₂ Emissions, MT
1	Jul-22	9477	8.53
2	Aug-22	8644	7.78
3	Sep-22	10174	9.16
4	Oct-22	9117	8.21
5	Nov-22	6739	6.07
6	Dec-22	10765	9.69
7	Jan-23	14058	12.65
8	Feb-23	12873	11.59
9	Mar-23	14615	13.15
10	Apr-23	17630	15.87
11	May-23	16837	15.15
12	Jun-23	21750	19.58
13	Total	152679	137.41
14	Maximum	21750	19.58
15	Minimum	6739	6.07
16	Average	12723.25	11.45

Chart No 1: Month wise CO₂ Emissions:



CHAPTER III STUDY OF USAGE OF RENEWABLE ENERGY

The Institute has installed Roof Top Solar PV Plant of Capacity **25 kWp**
In the following Table, we present the reduction in CO₂ emissions due to Solar Energy:

Table No 2: Computation of Reduction in CO₂ Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	25	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	30000	kWh
5	1 kWh of Electrical Energy saves	0.9	Kg/kWh
6	Qty of CO₂ Saved by Solar PV Plant = (4)*(5) /1000	27	MT of CO₂

Photograph of Roof Top Solar PV Plant:



CHAPTER IV STUDY OF WASTE MANAGEMENT

5.1 Segregation of Waste at Source:

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

Photograph of Waste Collection Bin:



5.2 Organic Waste Management:

It is recommended to convert the Organic Waste in a Bio Composting Bed

5.3 Sanitary Waste Management:

It is recommended to dispose of the Sanitary Waste in a Sanitary Waste Incinerator

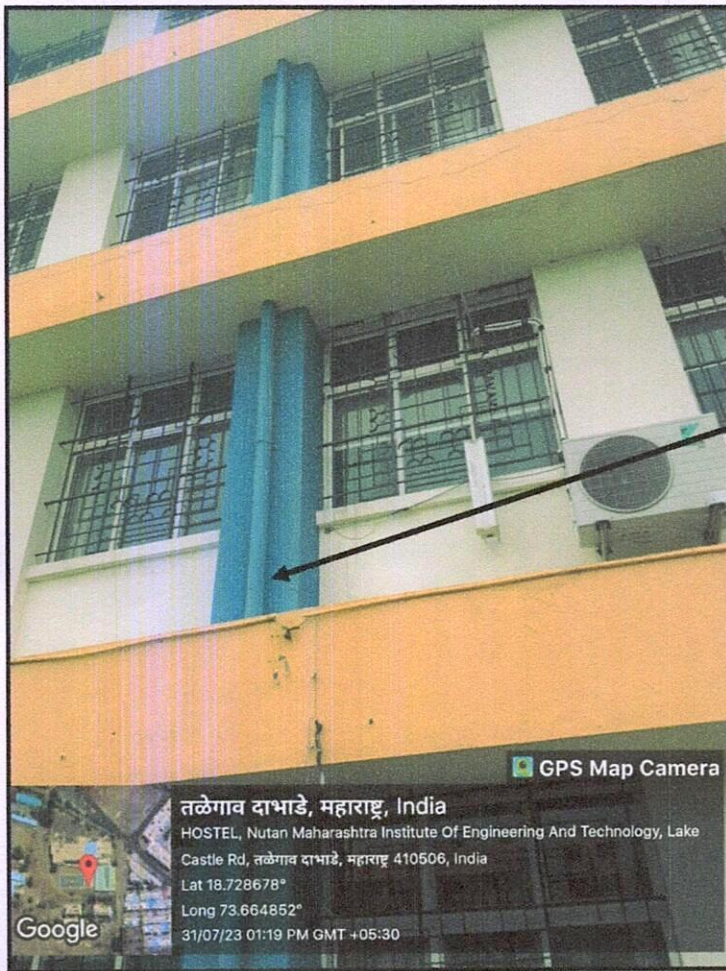
5.4 E Waste Management:

It is recommended to dispose of the E Waste through Authorized Agency

CHAPTER V STUDY OF RAIN WATER HARVESTING

The Institute has installed Pipes from the terrace and the Rain water falling on the terrace is used to increase the underground Water Table.

Photograph of Rain Water Carrying Pipe:



Rain Water
Carrying Pipe

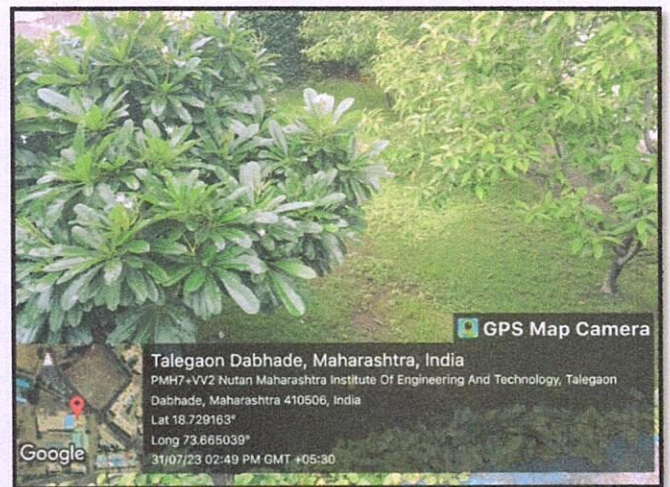


CHAPTER VI STUDY OF GREEN & SUSTAINABLE PRACTICES

6.1 Pedestrian Friendly Road & Internal Tree Plantation:

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

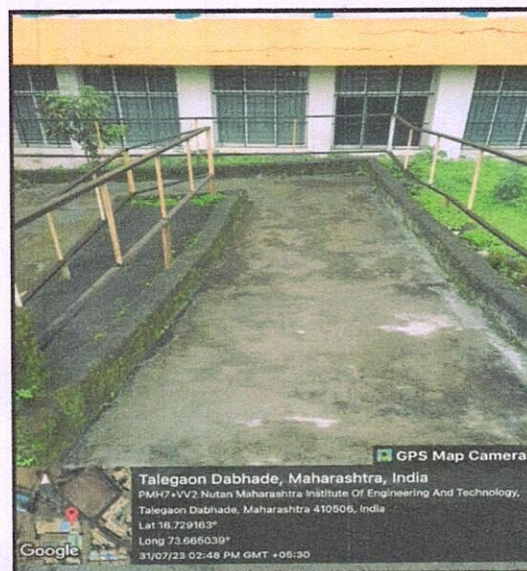
Photograph of Internal Road & Tree plantation:



6.2 Provision of Ramp for Divyangajan:

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

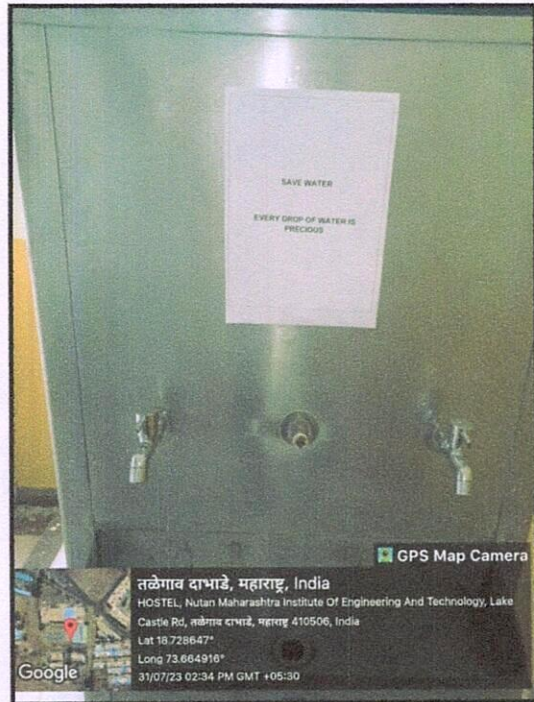
Photograph of Ramp:



6.3 Creation of Awareness about Water Conservation:

The Institute has displayed posters emphasizing on importance of Water Conservation.

Photograph of Poster on Water Conservation:



ANNEXURE-1:
LIST OF TREES IN THE CAMPUS:

List of Trees in the Campus:

No	Common Name	Qty
1	Palm	60
2	Guava	4
3	Jambhul	8
4	Mango	4
5	Son Champa	8
6	Banyan	2
7	Pimpal	4
8	Phycus	10
9	Shevari	3

ENVIRONMENTAL AUDIT REPORT

of

Nutan Maharashtra Vidya Prasarak Mandal's,
**NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING &
TECHNOLOGY, PUNE,**

Vishnupuri, Talegaon Dabhade, Pune 410 507

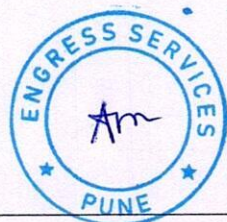


Year: 2022-23

Prepared by:

ENGRESS SERVICES

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ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society, Near Muktangan English School,
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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)

ENVIRONMENTAL AUDIT CERTIFICATE

Certificate No: ES/NMIET/22-23/03

Date: 31/7/2023

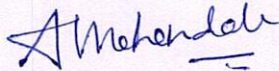
This is to certify that we have conducted Environmental Audit at Nutan Maharashtra Vidya Prasarak Mandal's Nutan Maharashtra Institute of Engineering & Technology Pune, Vishnupuri, Talegaon Dabhade, Pune, in the Year 2022-23.

The Institute has adopted following Environment Friendly Practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of Solar Thermal Water Heating System at Hostel Block
- Installation of 25 kWp Roof Top Solar PV Plant
- Segregation of Waste at source
- Implementation of Rain Water Management Project
- Internal Tree Plantation
- Creation of awareness about Water Conservation by Display of Posters

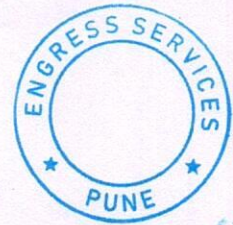
We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Eco Friendly.

For Engress Services,

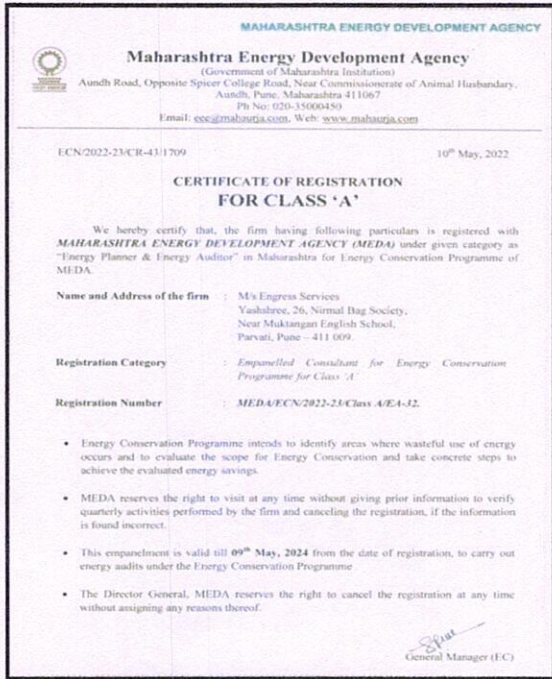


A Y Mehendale,

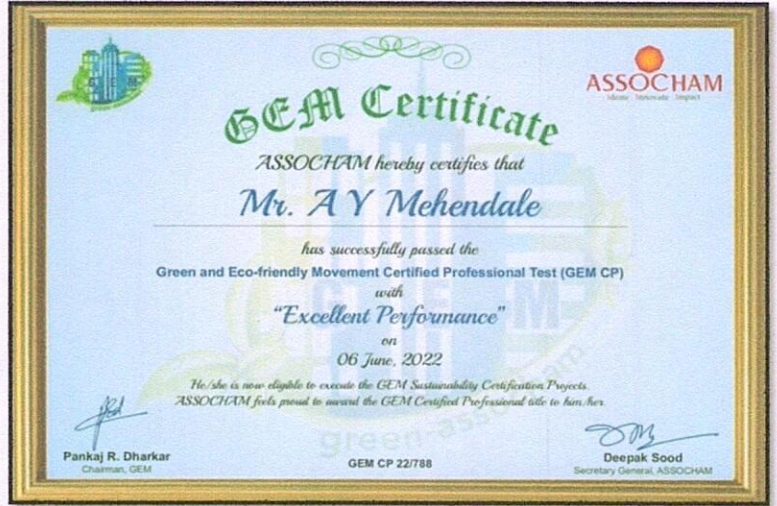
B E- Mech, M Tech-Energy, Certified Energy Auditor, EA-8192
ASSOCHAM GEM Certified Professional: GEM: 22/788



REGISTRATION CERTIFICATES



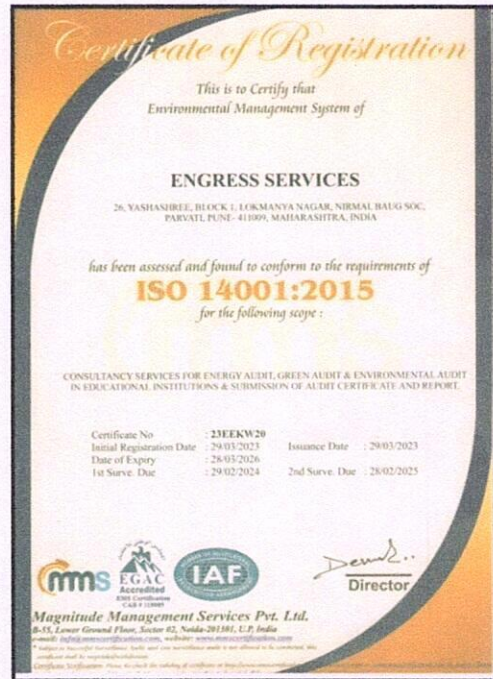
MEDA Registration Certificate



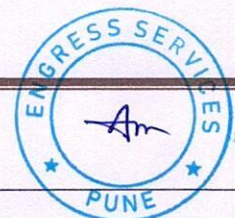
GEM Certified Professional Certificate



ISO: 9001-2015 Certificate



ISO: 14001-2015 Certificate



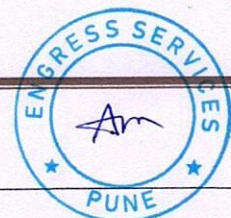
INDEX

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ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Nutan Maharashtra Vidya Prasarak Mandal's Nutan Maharashtra Institute of Engineering & Technology Pune, Vishnupuri, Talegaon Dabhade, Pune, for awarding us the assignment of Environmental Audit of their Talegaon Dabhade Campus for the Year: 2022-23.

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



EXECUTIVE SUMMARY

1. Nutan Maharashtra Vidya Prasarak Mandal's Nutan Maharashtra Institute of Engineering & Technology Pune, Vishnupuri, Talegaon Dabhade, Pune consumes Energy in the form of **Electrical Energy**; used for various Electrical Equipment.

2. Pollution due to Institute Activities:

- **Air pollution:** Mainly CO₂ on account of Electricity Consumption
- **Solid Waste:** Bio degradable Garden Waste
- **Liquid Waste:** Human liquid waste

3. Present Energy Consumption & CO₂ Emission:

No	Particulars	Value	Unit
1	Annual Energy Purchased	152679	kWh
2	Annual CO ₂ Emissions	137.41	MT

4. Renewable Energy & Reduction in CO₂ Emissions:

No	Particulars	Value	Unit
1	Solar PV Installed Capacity	25	kWp
2	Energy Generated in 2022-23	30000	kWp
3	Annual Reduction in CO ₂ Emissions	27	MT

5. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	37	23	30
2	Minimum	34	20	25

6. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	29.1	71	160	44
2	Minimum	27.9	70	109	39

7. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Recommended to Convert in a Bio Composting Bed
3	Sanitary Waste	Recommended to dispose in Sanitary Waste Incinerator
4	E Waste Management	Recommended to dispose of through Authorized Agency

8. Rain Water Harvesting:

The Institute has installed Pipes from the terrace and the Rain water falling on the terrace is used to increase the underground Water Table.

9. Environment Friendly Initiatives:

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

10. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg** of **CO₂** 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 CO₂ Emissions: www.tatapower.com
- For Solar PV Energy generation: www.solarrooftop.gov.in
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI & Water Quality Standards: www.cpcb.com

ABBREVIATIONS

Kg	:	Kilo Gram
MSEDCL	:	Maharashtra State Distribution Company Limited
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 complied 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.

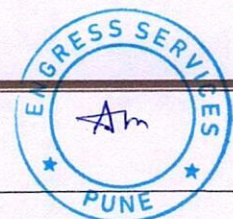
1.4 Audit Procedural Steps:



1.5 Institute Location Image:



Institute
Campus

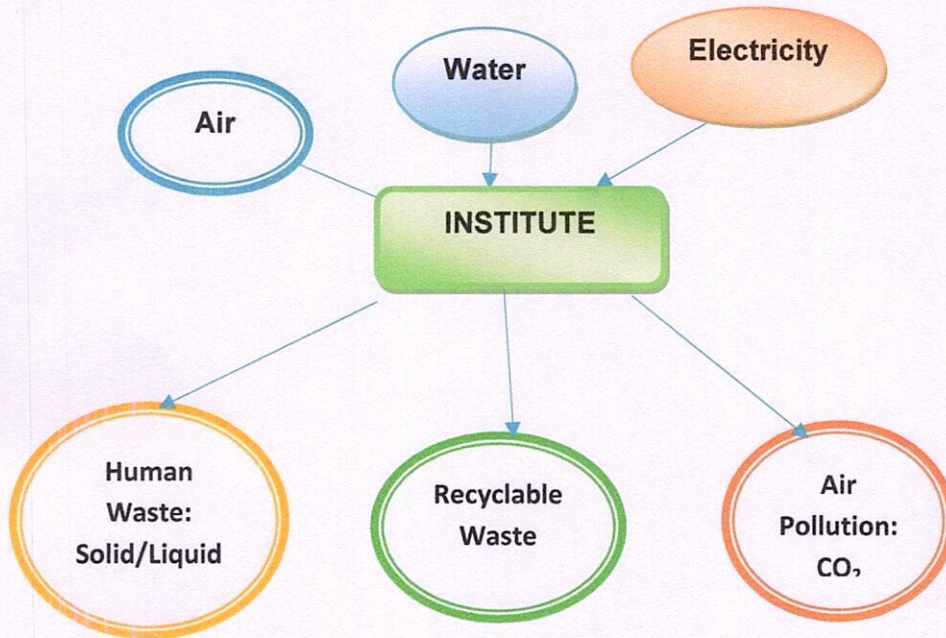


CHAPTER-II STUDY OF RESOURCE CONSUMPTION & CO₂ EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

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



Now we compute the Generation of CO₂ on account of consumption of Electrical Energy. The basis of Calculation for CO₂ emissions due to Electrical Energy is as under.

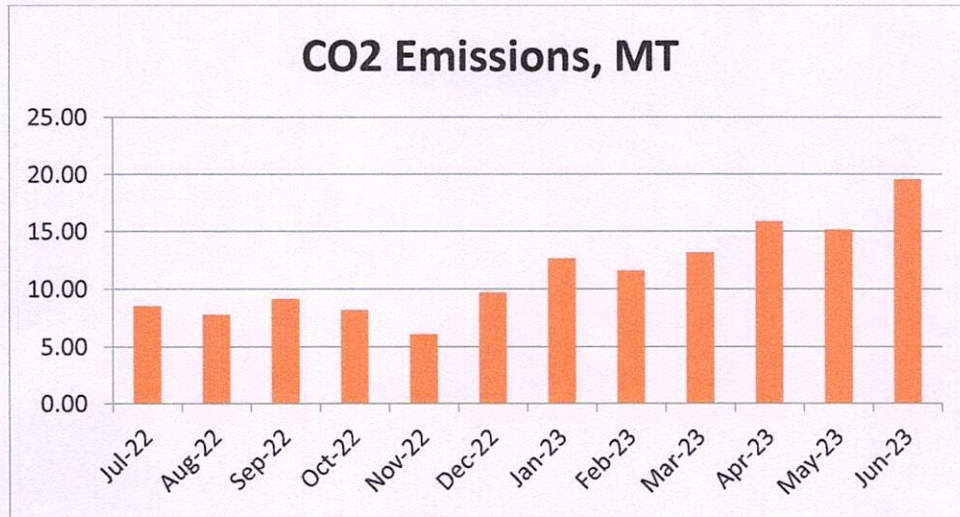
- 1 kWh of Electrical Energy releases 0.9 Kg of CO₂ into atmosphere

Table No 1: Study of Purchase of Energy & CO₂ Emissions: 22-23:

No	Month	Energy Purchased, kWh	CO ₂ Emissions, MT
1	Jul-22	9477	8.53
2	Aug-22	8644	7.78
3	Sep-22	10174	9.16
4	Oct-22	9117	8.21
5	Nov-22	6739	6.07
6	Dec-22	10765	9.69
7	Jan-23	14058	12.65
8	Feb-23	12873	11.59
9	Mar-23	14615	13.15

10	Apr-23	17630	15.87
11	May-23	16837	15.15
12	Jun-23	21750	19.58
13	Total	152679	137.41
14	Maximum	21750	19.58
15	Minimum	6739	6.07
16	Average	12723.25	11.45

Chart No 2: Month wise CO₂ Emissions:



CHAPTER III STUDY OF USAGE OF RENEWABLE ENERGY

The Institute has installed Roof Top Solar PV Plant of Capacity **25 kWp**
In the following Table, we present the reduction in CO₂ emissions due to Solar Energy:

Table No 2: Computation of Reduction in CO2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	25	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	30000	kWh
5	1 kWh of Electrical Energy saves	0.9	Kg/kWh
6	Qty of CO₂ Saved by Solar PV Plant = (4)*(5) /1000	27	MT of CO₂

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. 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 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
1	Computer Lab	35	21	26
2	Reading Hall	36	22	27
3	Room No: 106	37	23	28
4	Work Shop	34	20	25
5	Room No-306	36	23	30
	Maximum	37	23	30
	Minimum	34	20	25

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, °C	Humidity, %	Lux Level	Noise Level, dB
1	Computer Lab	27.9	71	109	39
2	Reading Hall	28	70	125	41
3	Room No: 106	28.2	69	129	40
4	Work Shop	28.6	69	140	43
5	Room No-306	29.1	70	160	44
	Maximum	29.1	71	160	44
	Minimum	27.9	70	109	39

CHAPTER VI STUDY OF WASTE MANAGEMENT

6.1 Segregation of Waste at Source:

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

Photograph of Waste Collection Bin:



5.2 Organic Waste Management:

It is recommended to convert the Organic Waste in a Bio Composting Bed

5.3 Sanitary Waste Management:

It is recommended to dispose of the Sanitary Waste in a Sanitary Waste Incinerator

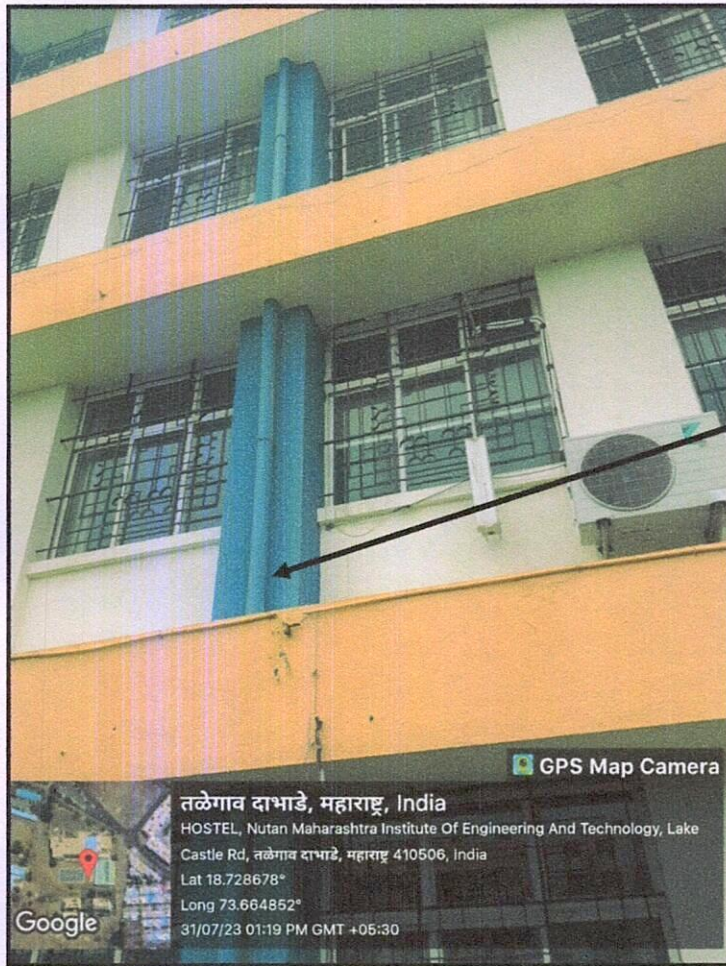
5.4 E Waste Management:

It is recommended to dispose of the E Waste through Authorized Agency

CHAPTER-VII STUDY OF RAIN WATER HARVESTING

The Institute has installed Pipes from the terrace and the Rain water falling on the terrace is used to increase the underground Water Table.

Photograph of Rain Water Carrying Pipe:



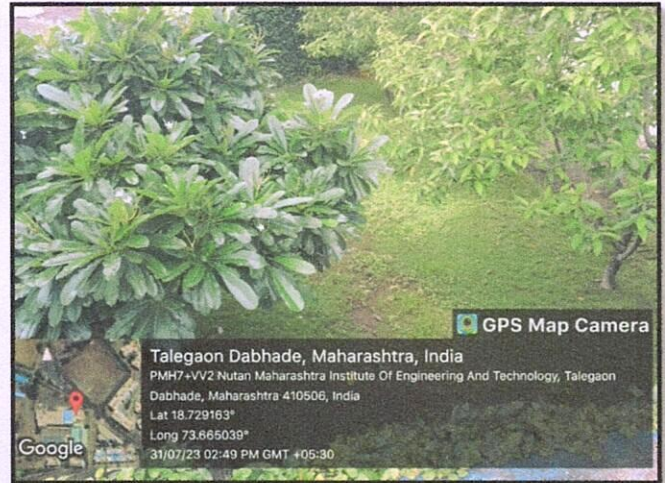
Rain Water
Carrying Pipe

CHAPTER-VIII STUDY OF ECO FRIENDLY INITIATIVES

8.1 Internal Tree Plantation:

The Institute has Tree Plantation in the campus.

Photograph of Tree plantation:



8.2 Creation of Awareness about Water Conservation:

The Institute has displayed posters emphasizing on importance of Water Conservation.

Photograph of Poster on Water 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

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

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