

ENVIRONMENTAL AUDIT REPORT

of

Progressive Education Society's
Modern Law College,
Pashan Road, Ganeshkhind, Pune



Year: 2020-21

Prepared by

Enrich Consultants,
Yashashree, 26, Nirmal Bag Society
Near Mukhtangan English School, Parvati, Pune 411009
Cell: 09890444795 Email: enrichcons@gmail.com



MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462



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/2021-22/CR-14/1577

22nd April, 2021

**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 Enrich Consultants
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Mukhtangan English School, Parvati,
Pune - 411009.

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

Registration Number : MEDA/ECN/2021-22/Class A/EA-03

- 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 **21st April, 2023** 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)



Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
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Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/PESMLC/20-21/03

Date: 12/8/2021

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Progressive Education Society's Modern Law College, Ganeshkhind, Pune in the year 2020-21.

The College has adopted following Environmental Friendly practices:

- Usage of Energy Efficient LED Lighting
- Installation of 5 kW Hybrid Roof Top Solar PV/Wind Power Plant.
- Installation of Bio Composting Tumbler Unit
- Installation of Rain Water Harvesting System
- Maintenance of internal Garden

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

For Enrich Consultants,

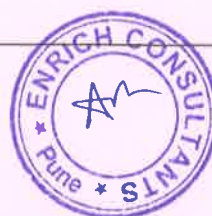


A Y Mehendale,
Certified Energy Auditor
EA-8192



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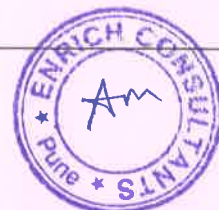
ACKNOWLEDGEMENT

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We are thankful to:

- Dr. Sunita Adhav, Principal
- Mr. Pawan Kalwala, Assistant Professor

We are also thankful to various Head of Departments & other Staff members for helping us during the field study.



EXECUTIVE SUMMARY

1. Progressive Education Society's Modern Law College, Ganeshkhind, Pune consumes Energy in the form of **Electrical Energy** used for various gadgets, Office & other facilities.

2. Various Pollution due to College Activities:

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

3. Present Energy Consumption & CO₂ Emission:

No	Parameter/ Value	Energy Consumed, kWh	CO ₂ Emissions, MT
1	Total	15189	13.67
2	Maximum	1661	1.49
3	Minimum	999	0.90
4	Average	1266	1.14

4. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient LED Lighting
- Maximum Usage of Day Lighting
- Installation of 5 kWp Roof Top Solar PV Plant

5. Usage of Renewable Energy & CO₂ Emission Reduction:

- The College has installed **5 kWp** Roof Top Solar PV Plant.
- The Energy generated by the Plant is **6000 kWh** per annum.
- The Reduction in CO₂ Emissions is **5.4 MT** per annum.

6. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	323	172	184
2	Minimum	210	98	102

7. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	79.7	90	789	89
2	Minimum	18.9	71	102	40



8. Waste Management:

8.1 Solid Waste Management:

The waste generated is segregated at source. The bio degradable waste is composted in a Bio composting tumbler unit and the fertilizer is used for own garden.

8.2 E-Waste Management:

The E-Waste generated is disposed of through Authorized vendors.

9. Rain Water Harvesting:

The College has installed Rainwater Harvesting System to collect the Rain Water collected at the Terrace which is used for enriching the ground water level.

10. Notes & Assumptions:

1. 1 Unit of Electrical Energy releases **0.9 Kg of CO₂** into atmosphere
2. **1 kWp** Solar PV system generates **4 kWh** of Electrical Energy per Day
3. Annual Solar Energy Generation Days: **300 Nos**

11. References:

- For CO₂ Emissions: www.tatapower.com
- For Energy Generated by Solar PV Plant: www.solarroftop.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

1.1 Important Definitions:

1.1.1 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

1.1.2. 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"

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

1.1.4. Relevant Environmental Laws in India: Table No-1:

1927	The Indian Forest Act
1972	The Wildlife Protection Act
1974	The Water (Prevention and Control of Pollution) Act
1977	The Water (Prevention & Control of Pollution) Cess Act
1980	The Forest (Conservation) Act
1981	The Air (Prevention and Control of Pollution) Act
1986	The Environment Protection Act
1991	The Public Liability Insurance Act
2002	The Biological Diversity Act
2010	The National Green Tribunal Act

1.1.5. Some Important Environmental Rules in India: Table No-2:

1989	Hazardous Waste (Management and Handling) Rules
1989	Manufacture, Storage and Import of Hazardous Chemical Rules
2000	Municipal Solid Waste (Management and Handling) Rules
1998	The Biomedical Waste (Management and Handling) Rules
1999	The Environment (Siting for Industrial Projects) Rules
2000	Noise Pollution (Regulation and Control) Rules
2000	Ozone Depleting Substances (Regulation and Control) Rules
2011	E-waste (Management and Handling) Rules
2011	National Green Tribunal (Practices and Procedure) Rules
2011	Plastic Waste (Management and Handling) Rules



1.1.6 National Environmental Plans & Policy Documents: Table No-3:

1.	National Forest Policy, 1988
2.	National Water Policy, 2002
3.	National Environment Policy or NEP (2006)
4.	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5.	Policy Statement for Abatement of Pollution (1992)
6.	National Action Plan on Climate Change
7.	Vision Statement on Environment and Human Health
8.	Technology Vision 2030 (The Energy Research College)
9.	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency)
10.	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

1.2 Objectives:

1. To study present usage of Natural resources the College is consuming
2. To Study CO₂ Emission
3. To study CO₂ Emission Reduction
4. To study Waste Management practices
5. To study Rain Water Harvesting
6. To study Environment Friendly Initiatives

1.3 Table No 4: General Details of College:

No	Head	Particulars
1	Name	Progressive Education Society's Modern Law College
2	Address	Pashan Road, Ganeshkhind, Pune
3	Year of Establishment	2003
4	Affiliation	Savitribai Phule Pune University



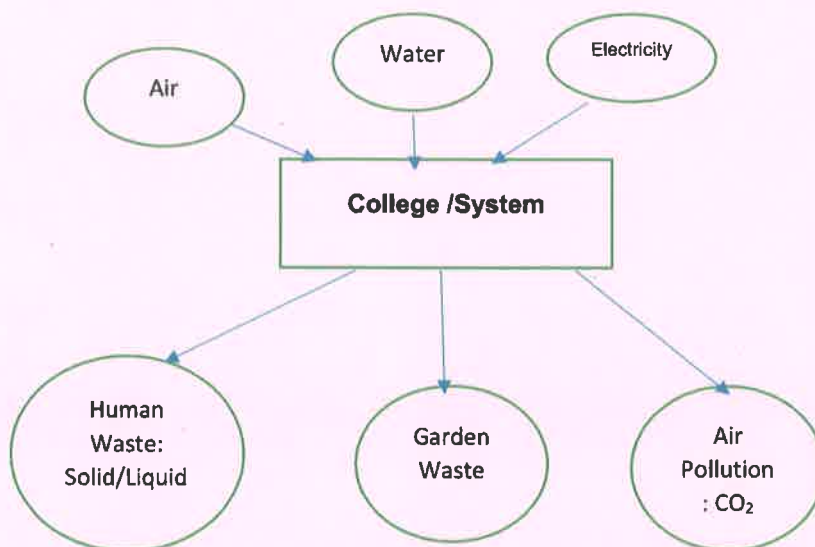
CHAPTER-II

STUDY OF CONSUMPTION OF RESOURCES AND CO₂ 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.



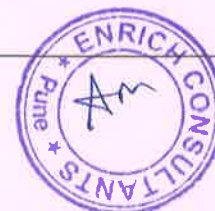
Now we compute the Generation of CO₂ on account of consumption of Electrical Energy.

The basis of Calculation for CO₂ emissions due to LPG & Electrical Energy are as under

- 1 Unit (kWh) of Electrical Energy releases **0.9 Kg of CO₂** into atmosphere

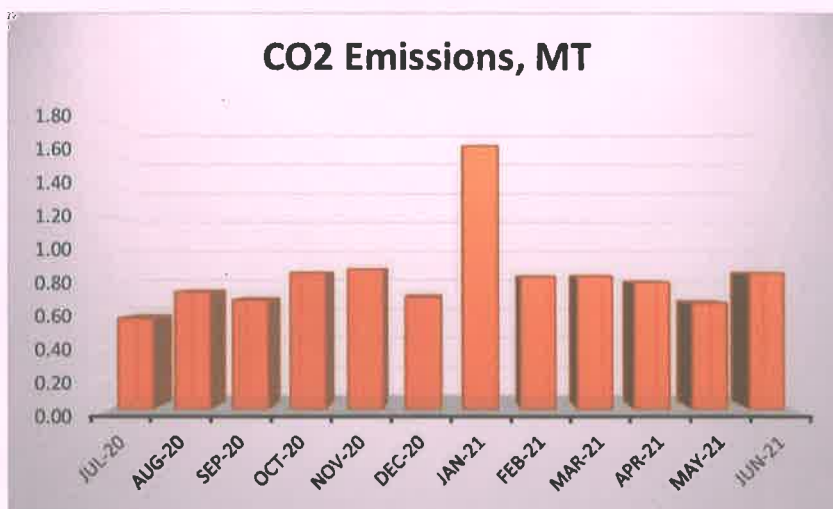
Table No 5: Study of Consumption of Electrical Energy & CO₂ Emissions: 20-21:

No	Month	Energy Consumed, kWh	CO ₂ Emissions, MT
1	Jul-20	630	0.57
2	Aug-20	815	0.73
3	Sep-20	759	0.68
4	Oct-20	950	0.86
5	Nov-20	975	0.88
6	Dec-20	780	0.70
7	Jan-21	1830	1.65
8	Feb-21	923	0.83



9	Mar-21	926	0.83
10	Apr-21	883	0.79
11	May-21	738	0.66
12	Jun-21	948	0.85
13	Total	11157	10.04
14	Maximum	1830	1.65
15	Minimum	630	0.57
16	Average	929.75	0.84

Chart No 2: To study the variation of Month wise Energy Consumption, kWh:



Key observations:

Table No 6: Important parameters:

No	Parameter	Energy consumed, kWh	CO2 emissions, MT
1	Total	22067	17.65
2	Maximum	2112	1.69
3	Minimum	1721	1.38
4	Average	1838.9	1.47



CHAPTER-III

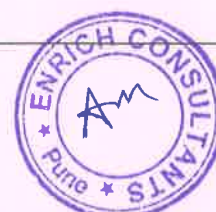
STUDY OF CO₂ EMISSION REDUCTION

The College has installed 5 kWp Roof Top Solar PV Plant.
In the following Table, we compute the reduction in CO₂ emission due to Solar PV Plant.

Table No 7: Computation of Reduction In CO₂ Emissions:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Capacity	5	kWp
2	Average Daily Energy generated per kWp	4	kWh/kWp
3	Annual Energy Generation Days	300	Nos
4	Annual Energy Generated by Solar PV Plant	6000	kWh
5	1 kWh of Electrical Energy is equivalent to	0.9	Kg of CO ₂
6	Reduction in Annual CO ₂ Emission = $(0.8) * (4) / 1000$	5.4	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 livability.

Rapid urbanization and industrialization has added other elements/compounds to the pure air and thus caused the increase in pollution. In order to prevent, control and abate air pollution, the Air (Prevention and Control of Pollution) Act was enacted in 1981.

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

According to Section 2(b) of Air (Prevention and control of pollution) Act, 1981 'air pollution' has been defined as **'the presence in the atmosphere of any air pollutant.'**

As per Section 2(a) of Air (Prevention and control of pollution) Act, 1981 'air pollutant' has been defined as **'any solid, liquid or gaseous substance [(including noise)] present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment'**

4.2 Air Quality Index:

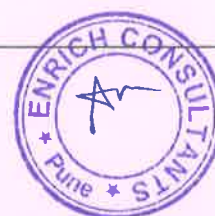
An **Air Quality Index (AQI)** is a number used by government agencies to measure the **air pollution** levels and communicate it to the population. As the AQI increases, it means that a large percentage of the population will experience severe adverse health effects. The measurement of the **AQI** requires an **air monitor** and an **air pollutant** concentration over a specified **averaging period**.

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 8: Indoor Air Quality Parameters:

No	Location	AQI	PM2.5	PM10
	Ground Floor			
1	Porch	320	172	184
2	Office	323	157	184



3	Library	320	150	172
4	Reading Hall	321	145	166
5	Staff Room	323	158	175
	First Floor			
1	Moot Court Hall	210	98	102
2	L-7 BA LLB-III	318	142	157
3	L-6 BALLB-II	316	150	169
4	L-5 BALLB	319	139	156
5	L-4 BALLB-I	313	136	156
	Second Floor			
1	L-8 BALLB-III	313	138	154
2	L-9 BALLB-IV	310	133	156
3	L-10 LR	270	109	127
4	Passage	293	123	148
	Third Floor			
1	L-11 BALLB IV	304	126	141
2	L-12 BALLB IV	293	110	145
3	L-14 BA LLB-II	260	111	124
4	L-16 BALLB-II	307	129	145
5	L-15 BALLB-I	305	129	152
	Maximum	323	172	184
	Minimum	210	98	102



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 9: Study of Indoor Comfort Condition Parameters:

No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
Ground Floor					
1	Porch	19.8	82	170	60
2	Office	18.9	87	116	56
3	Library	19.3	81	103	43
4	Reading Hall	19.3	86	119	40
5	Staff Room	19.3	85	119	58
First Floor					
1	Moot Court Hall	19.5	76	102	61
2	L-7 BA LLB-III	19.5	75	213	74
3	L-6 BALLB-II	19.6	78	220	78
4	L-5 BALLB	19.7	76	238	79
5	L-4 BALLB-I	19.8	79	148	79
Second Floor					
1	L-8 BALLB-III	20.3	83	115	79
2	L-9 BALLB-IV	20.6	90	478	75
3	L-10 LR	20.7	73	148	69
4	Passage	20.7	73	789	80
Third Floor					
1	L-11 BALLB IV	21	71	113	89
2	L-12 BALLB IV	21.1	71	502	84
3	L-14 BA LLB-II	21.3	73	125	78
4	L-16 BALLB-II	21.4	72	165	87
5	L-15 BALLB-I	21.5	82	203	89
	Maximum	21.5	90	789	89
	Minimum	18.9	71	102	40



CHAPTER VI

STUDY OF WASTE MANAGEMENT

6.1 Solid Waste Management:

The College has already installed a Bio composting Unit, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

Photograph of Bio Composting Tumbler Unit:



6.2 E-Waste Management:

The E-Waste generated is disposed of through Authorized Vendor.



CHAPTER-VII

STUDY OF RAIN WATER HARVESTING

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

Photograph of Rain Water Harvesting Pipe:



CHAPTER-VIII

STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

8.1 Green Landscaping with Trees and Plants:

The College has well maintained internal garden.

Photograph of Internal Garden:



8.2 Sanitary Pad Dispenser and Sanitary Waste Incinerator:

The College has installed Sanitary Pad Dispenser as well as Sanitary Waste Incinerator.

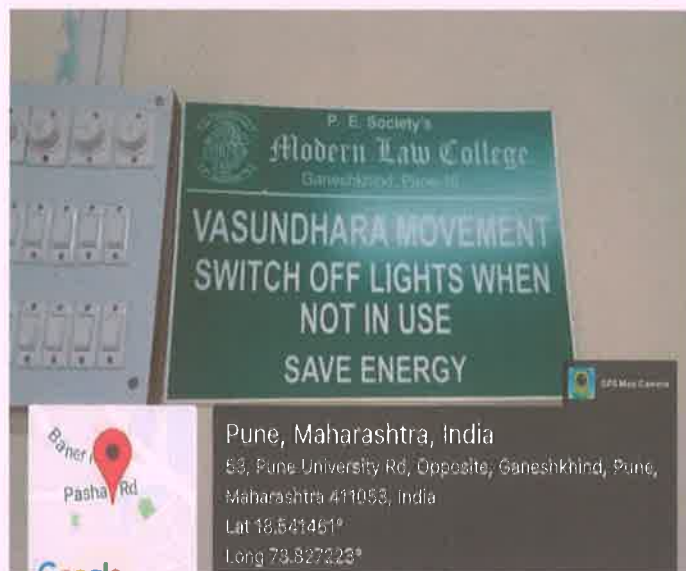
Photograph of Sanitary Pad Dispenser & Incinerator:



8.3 Creation of Awareness about Energy Conservation:

The College has installed Posters emphasizing the Importance of Energy Conservation.

Photograph of Poster on Energy Conservation:



8.4 Creation of Awareness about Water Conservation:

The College has installed Posters emphasizing the Importance of Water Conservation.

Photograph of Poster on Water Conservation:



ANNEXURE-I: **VARIOUS AIR QUALITY, WATER QUALITY, NOISE & INDOOR** **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 Water Quality Standards:

No	Designated Best Use	Criteria
1	Drinking Water Source without conventional Treatment but after disinfection	pH between 6.5 to 8.5 Dissolved Oxygen 6 mg/l or more
2	Drinking water source after conventional treatment and disinfection	pH between 6 to 9 Dissolved Oxygen 4 mg/l or more
3	Outdoor Bathing (Organized)	pH between 6.5 to 8.5 Dissolved Oxygen 5 mg/l or more
4	Controlled Waste Disposal	pH between 6 to 8.5



3. 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%



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- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of **5 kWp** Roof Top Solar PV Plant.

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

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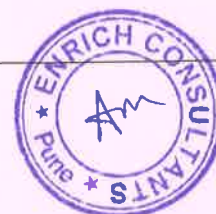


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CHAPTER-I

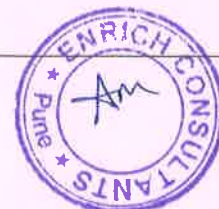
INTRODUCTION

1.1 Objectives:

1. To study present Energy Consumption
2. To Study the present CO₂ emissions
3. To study Usage of Renewable Energy
4. To study Usage of LED Lighting

1.2 Table No-1: General Details of College:

No	Head	Particulars
1	Name	Progressive Education Society's Modern Law College
2	Address	Pashan Road, Ganeshkhind, Pune
3	Year of Establishment	2003
4	Affiliation	Savitribai Phule Pune University



CHAPTER-II

STUDY OF CONNECTED LOAD

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

2.1 Table No-2: Details of Overall Connected Load:

No	Location	40 W FTL	22W LED	20W LED	12W LED	FAN	AC	PC
	Ground Floor							
1	Entrance		3	1				
2	Office	1	4			4	1	5
3	Passage			2		1		
4	Staff Room			2		2	1	6
5	Sick Room			1		1		
6	Exam Control Room		2			1		1
7	LLM Department				4	1		1
8	Outside LLM Dept			1		1		
9	Pantry	1						
10	IQAC Conference Hall			4	6	1	1	
11	Principal Room		1		6	1	1	1
12	Ladies Toilet			3				
12	Gents Toilet			1				
13	Vice Principal Cabin			1		1		
14	Outside Library		2	5				
15	Reading Hall		29			8		
16	Toilet			1				
17	Parking			4				
18	Passage			1				
19	Legal Research Center		8			2		9
20	Books Room		20			4		
21	L-1	5				2		
22	L-2	3				3		
23	L-3	6				2		
24	Store Room			1				
25	NSS Room		4			2		
26	Gym	4				3		
27	Legal Aid Center		6					



	First Floor							
No	Location							
1	Staircase			1				
2	Placement Cell					1		
3	Passage			2				
4	L-4			8		4		
5	L-5			7		5		
6	Moot Court Hall	8	1		2	6	3	
7	Passage			3				
8	Ladies Toilet		6			1		
9	Gents Toilet		4	1		1		
10	L-6			5		5		
11	L-7			6		5		
	Second Floor							
No	Location							
1	Passage	7		1				
2	L-8	4		1		3		
3	L-9	5				3		
4	L-10	5				6		
5	Ladies Toilet	3		1		3		
6	Gents Toilet	2						
	Third Floor							
No	Location							
1	Passage	2						
2	L-11	6				3		
3	L-12	6				3		
4	L-13	6				3		
5	Ladies Toilet	2						
6	Gents Toilet	2						
	Total	78	90	64	18	92	7	23

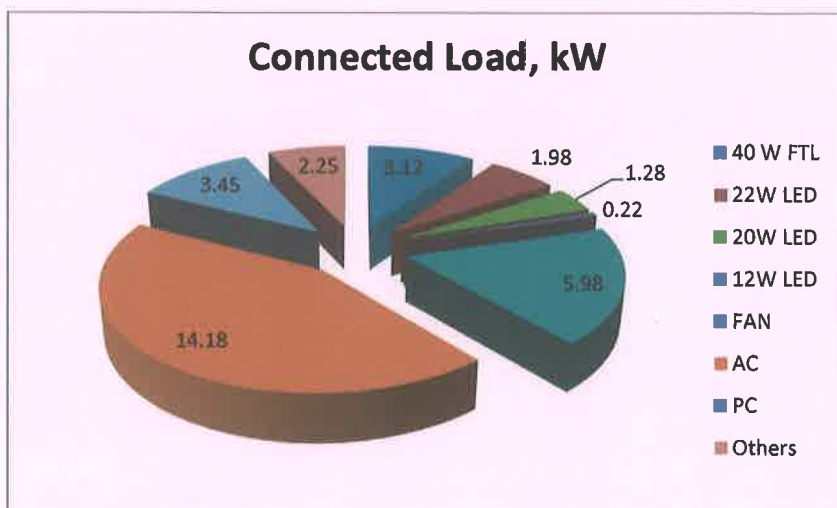


Now we present the connected load- Equipment wise in the following Table.

Table No-3: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL	78	40	3.12
2	22W LED	90	22	1.98
3	20W LED	64	20	1.28
4	12W LED	18	12	0.22
5	FAN	92	65	5.98
6	AC	7	2025	14.18
7	PC	23	150	3.45
8	Others	15	150	2.25
9	Total			32.45

Chart No-1: Details of Connected Load:



CHAPTER-III

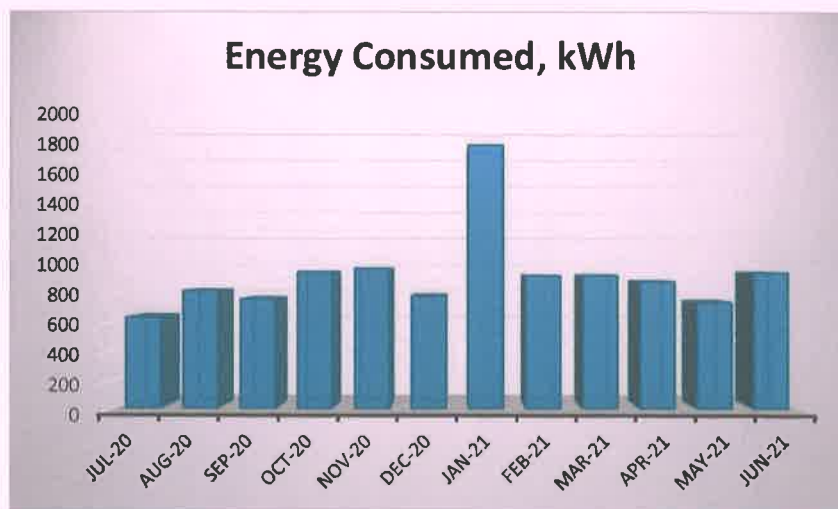
STUDY OF ELECTRICAL ENERGY CONSUMPTION

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

Table No 4: Electrical Energy Consumption Analysis- 2020-21:

No	Month	Energy Consumed, kWh
1	Jul-20	630
2	Aug-20	815
3	Sep-20	759
4	Oct-20	950
5	Nov-20	975
6	Dec-20	780
7	Jan-21	1830
8	Feb-21	923
9	Mar-21	926
10	Apr-21	883
11	May-21	738
12	Jun-21	948
13	Total	11157
14	Maximum	1830
15	Minimum	630
16	Average	929.75

Chart No-2: To study the variation of Month wise Energy Consumption, kWh:



Key observations:

Table No 5: Important parameters:

No	Parameter	Energy consumed, kWh
1	Total	11157
2	Maximum	1830
3	Minimum	630
4	Average	929.75



CHAPTER-IV

CARBON FOOTPRINTING

4.1 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 College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets.

4.2 Basis for computation of CO₂ Emissions:

The basis of Calculation for CO₂ emissions due to Electrical Energy are: 1 Unit (kWh) of Electrical Energy releases **0.9 Kg of CO₂** into atmosphere

Based on the above Data we compute the CO₂ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

4.3 Table No 6: Month wise CO₂ Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jul-20	630	0.57
2	Aug-20	815	0.73
3	Sep-20	759	0.68
4	Oct-20	950	0.86
5	Nov-20	975	0.88
6	Dec-20	780	0.70
7	Jan-21	1830	1.65
8	Feb-21	923	0.83
9	Mar-21	926	0.83
10	Apr-21	883	0.79
11	May-21	738	0.66
12	Jun-21	948	0.85
13	Total	11157	10.04
14	Maximum	1830	1.65
15	Minimum	630	0.57
16	Average	929.75	0.84



4.4 Chart No-3: Representation of Month wise CO₂ emissions:

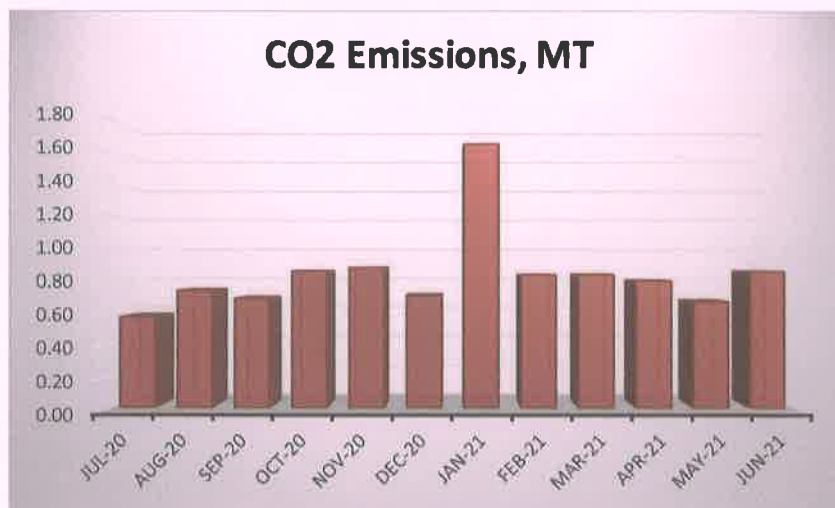


Table No 7: Key observations:

No	Parameter	Energy consumed, kWh	CO2 emissions, MT
1	Total	11157	10.04
2	Maximum	1830	1.65
3	Minimum	630	0.57
4	Average	929.75	0.84



CHAPTER-V

STUDY OF USAGE OF ALTERNATE ENERGY

The College has installed **5 kWp** Roof Top Solar PV Plant.

In the following Table, we compute the % usage of Alternate Energy to Annual Energy Demand.

Table No 8: Computation of % Usage of Alternate Energy:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Capacity	5	kWp
2	Average Daily Energy generated per kWp	4	kWh/kWp
3	Annual Energy Generation Days	300	Nos
4	Annual Energy Generated by Solar PV Plant	6000	kWh
5	Energy purchased from MSEDCL	11157	kWh
6	Total Energy Requirement = (4) + (5)	17157	kWh
7	% of Usage of Alternate Energy to Annual Energy Demand = $(4) * 100 / (6)$	35	%

Photograph of Roof Top Solar PV Plant:



CHAPTER-VI

STUDY OF USAGE OF LED LIGHTING

The College has about 78 Nos 40 W FTL fittings & LED fittings. In the following Table, we present the percentage of usage of LED lights to the annual Lighting power requirement.

Table No-9: Study of Lighting Load:

No	Particulars	Value	Unit
1	Qty of 40 W FTL	78	Nos
2	Load/Unit of 40 W FTL	40	W/Unit
3	Total Load of 40 W FTL fittings	3.12	kW
4	Qty of 12 W LED fitting	18	Nos
5	Load/Unit of 12 W LED fitting	12	W/Unit
6	Total Load of 12 W LED fittings	0.216	kW
7	Qty of 20 W LED fitting	64	Nos
8	Load/Unit of 20 W LED fitting	12	W/Unit
9	Total Load of 20 W LED fittings	0.768	kW
10	Qty of 22 W LED fitting	90	Nos
11	Load/Unit of 22 W LED fitting	22	W/Unit
12	Total Load of 22 W LED fittings	1.98	kW
13	Total Lighting Load=3+6+9+12	6.084	kW
14	Total LED Lighting Load=6+9+12	2.964	kW
15	Daily Operating period	6	Hrs
16	Annual Operating Days	150	Nos
17	Annual Total Lighting power required	5475.6	kWh/Annum
18	Annual LED Power required	2667.6	kWh/Annum
19	% of LED lighting to Total Annual Lighting Requirement	49	%



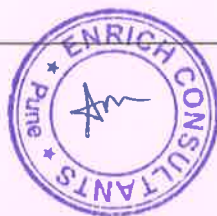
GREEN AUDIT REPORT
of
**Progressive Education Society's
Modern Law College,
Pashan Road, Ganeshkhind, Pune**



Year: 2020-21

Prepared by

Enrich Consultants,
Yashashree, 26, Nirmal Bag Society
Near Muktangan English School, Parvati, Pune 411009
Cell: 09890444795 Email: enrichcons@gmail.com



MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001 : 2000 Reg. no. : RC 91 / 2482



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/2021-22/CR-14/1577

22nd April, 2021

**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 Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Muktangan English School, Parvati,
Pune - 411009.

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

Registration Number : **MEDA/ECN/2021-22/Class A/EA-03**

- 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 **21st April, 2023** 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)



Enrich Consultants

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

Ref: EC/PESMLC/20-21/02

Date: 12/8/2021

CERTIFICATE

This is to certify that we have conducted Green Audit at Progressive Education Society's Modern Law College, Ganeshkhind, Pune in the year 2020-21.

The College has adopted following Energy Efficient and Green practices:

- Usage of Energy Efficient LED Lighting
- Usage of BEE STAR Rated equipment
- Installation of **5 kWp** Roof Top Solar PV Power Plant.
- Installation of Bio Composting Tumbler Unit
- Installation of Rain Water Harvesting System
- Maintenance of good Internal Roads
- Maintenance of Garden in the Campus

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

For Enrich Consultants,



A Y Mehendale,
Certified Energy Auditor
EA-8192



INDEX

Sr. No	Particulars	Page No
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III	Abbreviations	8
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2	Study of Present Energy Consumption	10
3	Carbon Foot printing	12
4	Study of Usage of Renewable Energy	14
5	Study of Waste Management	15
6	Study of Rain Water Harvesting	16
7	Study of Green Practices	17



ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Progressive Education Society's Modern Law College, Pune for awarding us the assignment of Green Audit of their Ganeshkhind campus for the Year: 2020-21.

We are thankful to:

- Dr Sunita Adhav, Principal
- Mr. Pawan Kalwala, Assistant Professor

We are also thankful to various Head of Departments & other Staff members for helping us during the field study.



EXECUTIVE SUMMARY

1. Modern Law College, Ganeshkhind, Pune consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

2. Present Level of Energy Consumption & CO₂ Emission:

No	Parameter/ Value	Energy consumed, kWh	CO ₂ emissions, MT
1	Total	11157	10.04
2	Maximum	1830	1.65
3	Minimum	630	0.57
4	Average	929.75	0.84

3. Various Majors Adopted for Energy Conservation:

The various projects already implemented by the College are

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated ACs
- Installation of 5 kWp Roof top Solar PV Plant

4. Usage of Renewable Energy & CO₂ Emission Reduction:

- The College has installed 5 kWp Roof Top Solar PV Plant.
- The Energy generated by the Plant is 6000 kWh per annum.
- The Reduction in CO₂ Emissions is 5.4 MT per annum.

5. Waste Management:

5.1 Solid Waste Management:

The waste generated is segregated at source. The bio degradable waste is composted in a Bio composting tumbler unit and the fertilizer is used for own garden.

5.2 E-Waste Management:

The E-Waste generated is disposed of through Authorized vendors.

6. Rain Water Harvesting:

The College has installed Rainwater Harvesting System to collect the Rain Water collected at the Terrace which is used for enriching the ground water level.

7. Green & Sustainable Practices:

- Maintenance of Good internal roads
- Maintenance of Landscaped garden
- Provision of Ramp & Dedicated Wash room for Divyangajan



- Provision of Sanitary Pad Dispenser and Sanitary Waste Incinerator
- Awareness creation on Energy & Water Conservation by display of posters

8. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg of CO₂** into atmosphere
2. **1 kWp** Solar PV system generates **4 kWh** of Electrical Energy per Day
3. Annual Solar Energy Generation Days: **300** Nos.

9. References:

1. For CO₂ Emissions: www.tatapower.com
2. For Solar PV Energy Generation: www.solarrooftop.gov.in



ABBREVIATIONS

AC	: Air conditioner
CFL	: Compact Fluorescent Lamp
FTL	: Fluorescent Tube Light
LED	: Light Emitting Diode
kWh	: kilo-Watt Hour
Qty	: Quantity
W	: Watt
kW	: Kilo Watt
PF	: Power Factor
M D	: Maximum Demand
PC	: Personal Computer
MT	: Metric Ton



CHAPTER-I

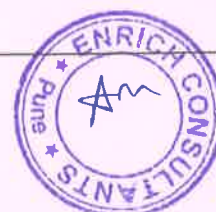
INTRODUCTION

1.1 Objectives:

1. To study present Energy Consumption
2. To Study the present CO₂ emissions
3. To study usage of Renewable Energy
4. To study Waste Management
5. To study rain water harvesting
6. To stud Green Practices

1.2 Table No-1: General Details of College:

No	Head	Particulars
1	Name	Progressive Education Society's Modern Law College
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CHAPTER-II

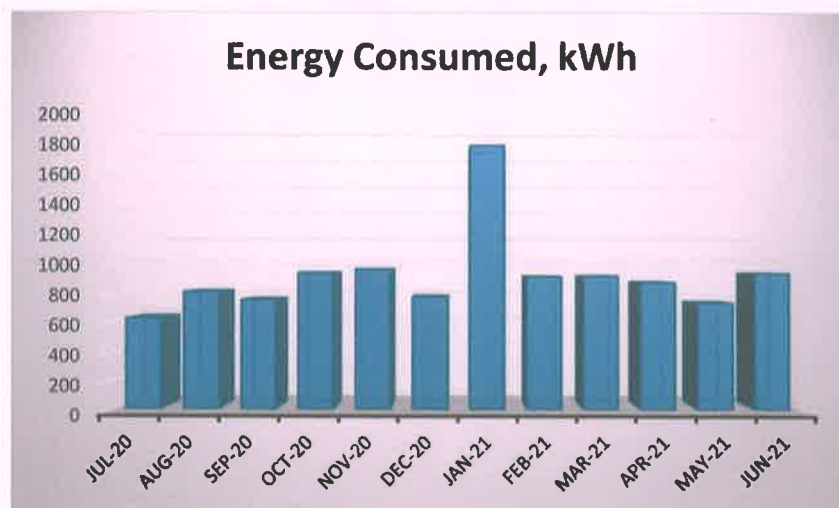
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Chart No-2: To study the variation of Month wise Energy Consumption, kWh:



Key observations:

Table No 5: Important parameters:

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CHAPTER-III

CARBON FOOTPRINTING

3.1 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 College for performing its day to day activities

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The basis of Calculation for CO₂ emissions due to Electrical Energy are: 1 Unit (kWh) of Electrical Energy releases **0.9 Kg of CO₂** into atmosphere

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13	Total	11157	10.04
14	Maximum	1830	1.65
15	Minimum	630	0.57
16	Average	929.75	0.84



Chart No 2: Representation of Month wise CO₂ emissions:

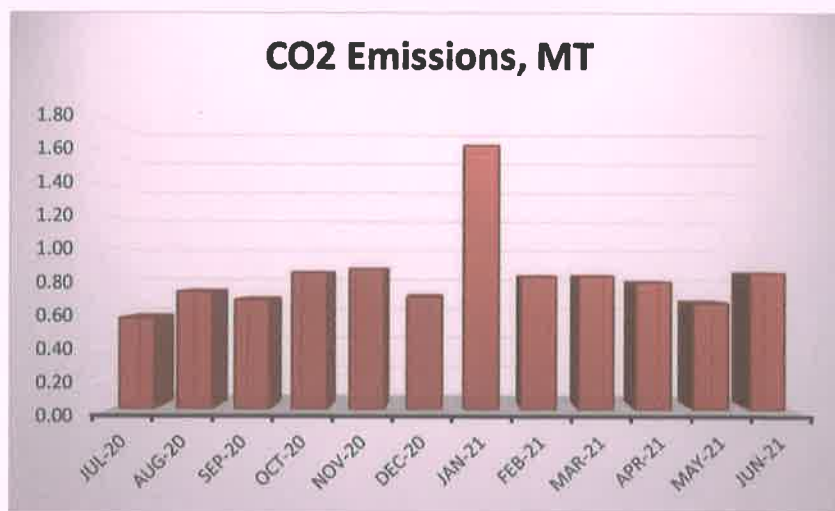


Table No 5: Key observations:

No	Parameter	Energy consumed, kWh	CO2 emissions, MT
1	Total	11157	10.04
2	Maximum	1830	1.65
3	Minimum	630	0.57
4	Average	929.75	0.84



CHAPTER-IV

STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed **5 kWp** Roof Top Solar PV Plant.

In the following Table, we compute the Energy generated and reduction in CO₂ Emissions.

Table No 6: Computation of Reduction In CO₂ Emissions due to 5 kWp Solar PV Plant:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Capacity	5	kWp
2	Average Daily Energy generated per kWp	4	kWh/kWp
3	Annual Energy Generation Days	300	Nos
4	Annual Energy Generated by Solar PV Plant	6000	kWh
5	1 kWh of Electrical Energy is equivalent to	0.9	Kg of CO ₂
6	Reduction in Annual CO ₂ Emission = $(0.8) * (4) / 1000$	5.4	MT

Photograph of Roof Top Solar PV Plant:



CHAPTER V

STUDY OF WASTE MANAGEMENT

5.1 Solid Waste Management:

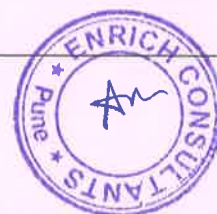
The College has installed a Bio composting Tumbler Unit, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

Photograph of Bio Composting Storage Tanks:



5.2 E-Waste Management:

The E-Waste generated is disposed of through Authorized Vendor.

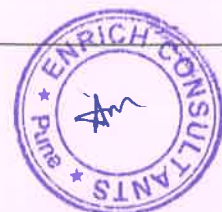


CHAPTER-VI

STUDY OF RAIN WATER HARVESTING

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

Photograph of Rain Water Harvesting Pipe:



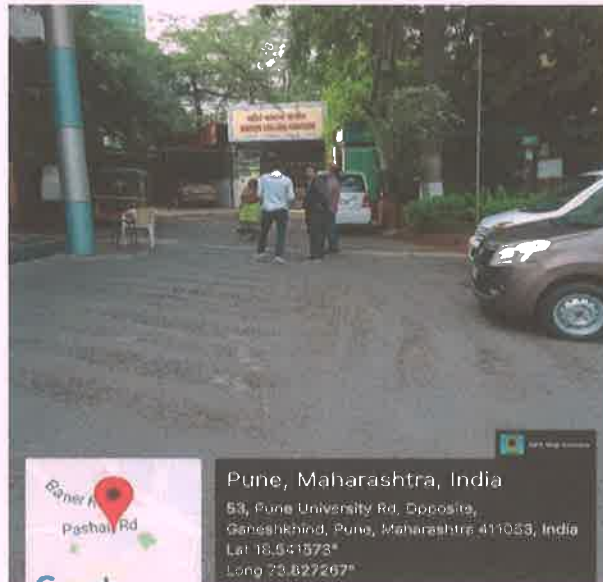
CHAPTER-VII

STUDY OF GREEN & SUATAINABLE PRACTICES

7.1 Pedestrian Friendly Roads:

The College has pedestrian friendly road as to facilitate the easy movement of the students within the campus.

Photograph of Internal Road:



7.2 Green Landscaping with Trees and Plants:

The College has well maintained internal garden.

Photograph of Internal Garden:



7.3 Provision of Ramp for Divyangajan:

The College has made a provision of Ramp as well as dedicated wash room for easy movement of Divyangajan.

Photograph of Ramp and Dedicated Wash room:



7.4 Sanitary Pad Dispenser and Sanitary Waste Incinerator:

The College has installed Sanitary Pad Dispenser as well as Sanitary Waste Incinerator.

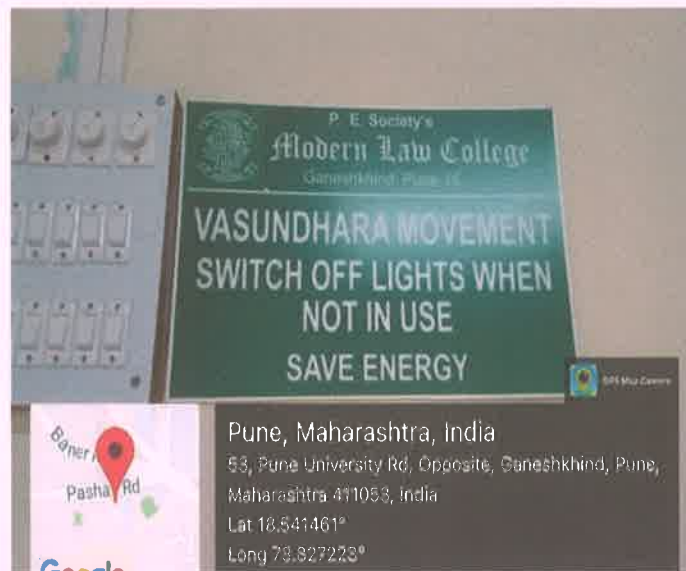
Photograph of Sanitary Pad Dispenser & Incinerator:



7.5 Creation of Awareness about Energy Conservation:

The College has installed Posters emphasizing the Importance of Energy Conservation.

Photograph of Poster on Energy Conservation:



7.6 Creation of Awareness about Water Conservation:

The College has installed Posters emphasizing the Importance of Water Conservation.

Photograph of Poster on Water Conservation:



ANNEXURE-1:
LIST of TREES & PLANTS:

No.	Name of Tree	Family	Common Name
1.	<i>Aegle marmelos</i> (L.) Correa.	Rutaceae	Bel
2.	<i>Ailanthus excelsa</i> Roxb.	Simaroubaceae	
3.	<i>Albizia julibrissin</i> Durazz.	Fabaceae	
4.	<i>Areca catechu</i> L.	Arecaceae	
5.	<i>Arucaria heterophylla</i> (Salisb.) Franco.	Araucariaceae	
6.	<i>Azadirachta indica</i> A.Juss.	Meliaceae	
7.	<i>Bambusa vulgaris</i> Schrad. ex J.C.Wendl	Poaceae	
8.	<i>Caryota mitis</i> Lour.	Arecaceae	Fishtail palm
9.	<i>Cassia fistula</i> L.	Fabaceae	
10.	<i>Casuarina equisetifolia</i> L.	Casurinaceae	
11.	<i>Citrus limon</i> (L.) Osbeck.	Rutaceae	Lemon/Limbu
12.	<i>Cocos nucifera</i> L.	Arecaceae	
13.	<i>Delonix regia</i> (Boj. ex Hook.) Raf.	Fabaceae	
14.	<i>Dypsis lutescens</i> (H.Wendl.) Beentje & J.Dransf.	Arecaceae	
15.	<i>Erythrina variegata</i> L.	Fabaceae	pangara
16.	<i>Ficus benghalensis</i> L.	Moraceae	Vad
17.	<i>Ficus benjamina</i> L.	Moraceae	Weeping fig
18.	<i>Ficus elastic</i> Roxb. ex Hornem.	Moraceae	
19.	<i>Ficus racemosa</i> L.	Moraceae	
20.	<i>Ficus religiosa</i> L.	Moraceae	Pimpal
21.	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	
22.	<i>Jacaranda mimosifolia</i> D. Don.	Bignoniaceae	
23.	<i>Lawsonia inermis</i> L.	Lytheraceae	Mehandi
24.	<i>Livistona chinensis</i> (Jacq.) R.Br. ex Mart.	Arecaceae	
25.	<i>Magnolia champaca</i> (L.) Baill. ex Pierre	Magnoliaceae	Pivla Chafa
26.	<i>Mangifera indica</i> L.	Anacardiaceae	
27.	<i>Manilkara zapota</i> (L.) P.Royen	Sapotaceae	Sapota/Chiku
28.	<i>Millingtonia hortensis</i> L.F.	Bignoniaceae	Indian cork tree
29.	<i>Murraya koenigii</i> (L.) Sprengel	Rutaceae	Curry leaf/Godlimb
30.	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Aavala
31.	<i>Plumeria alba</i> L.	Apocynaceae	



32.	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	Annonaceae	Ashok
33.	<i>Ravenalia madagascarensis</i> Sonn.	Sterlitzaceae	
34.	<i>Roystonea regia</i> (Kunth) O. F. Cook	Arecaceae	
35.	<i>Syzygium cumuni</i> (L.) Skills	Myrtaceae	Jambhul
36.	<i>Tamarindus indica</i> L.	Fabaceae	Chinch
37.	<i>Tecoma stans</i> (L.) Juss. Ex Kunth.	Bignoniaceae	
38.	<i>Terminalia catappa</i> L.	Combretaceae	

MEDICINAL/AROMATIC/SPICES PLANTS

1. *Aloe vera* Burm
2. *Asparagus racemosus* Willd.
3. *Asparagus densiflorus* (Kunth) Jessop
4. *Bryophyllum pinnatum* (Lam.) Oken
5. *Catharanthus roseus* L.
6. *Centella asiaticatica* (L.) Urb.
7. *Chlorophytum inornatum* Ker Gawl.
8. *Cinnamomum tamala* (Buch.-Ham.) T. Nees & Eberm.
9. *Cissus quadrangulari* L.
10. *Costus igneus* N.E. Br.
11. *Cymbopogon citratus* DC
12. *Eclipta prostrata* (L.) L.
13. *Euphorbia tirucalli* L.
14. *Gymnema sylvestre* R. Br.
15. *Justicia adhatoda* L.
16. *Mentha arvensis* L.
17. *Mimosa pudica* L.
18. *Murraya koenigii* (L.) Spreng.
19. *Ocimum sanctum* L.
20. *Piper nigrum* L.
21. *Spilanthes acmella* Dc.

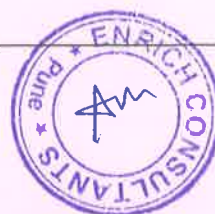


FERN

1. *Asplenium nidus* L.
2. *Livistona rotundifolia* (Lam.) Mart.
3. *Nephrolepis biserrata* (Sw.) Schott.
4. *Nephrolepis* Sp.
5. *Pteris ensiformis* Burm. F.

FLOWERING/ FOLIAGE PLANTS

1. *Adenium obesum* (forssk.) Roem. & schult.
2. *Allamanda violacea* Gardner
3. *Asparagus densiflorus* (Kunth) Jessop
4. *Bryophyllum* sp.
5. *Canna indica* L.
6. *Chlorophytum comosum* (Thunb.).
7. *Chlorophytum comosum* (Thunb.) Jacques
8. *Clematis triloba* Thunb.
9. *Coleus blumei* Benth.
10. *Crossandra undulaefolia* Salisb.
11. *Dracaena colorama*
12. *Dracaena deremensis* Engl
13. *Dracaena marginata* Hort.
14. *Euphorbia milli* Des Moul.
15. *Euphorbia pulcherrima* Willd. Ex Klotzsch
16. *Hibiscus rosa-sinensis* L.
17. *Ixora chinensis* Lam.
18. *Jatropha integerrima* Jacq.
19. *Nerium indicum* Mill.
20. *Oxalis regnelli* Miq.
21. *Pentas lanceolata* (Forssk) Defflers
22. *Rhoeo spathacea* (Sw.) Stearn



ELECTRICAL SAFETY AND POWER QUALITY AUDIT REPORT
Of
Progressive Education Society's
MODERN LAW COLLEGE,
Ganeshkhind, Pune



Prepared By

Enrich Consultants

26, Nirmal bag society, Parvati, Pune-411009
Phone No-09890444795 Email: enrichcons@gmail.com



MAHARASHTRA ENERGY DEVELOPMENT AGENCY

**Maharashtra Energy Development Agency**

(A Government of Maharashtra undertaking)

2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006,

Ph No: 020-26614393/266144403

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

ECN/2018-19/CR-05/4174

19th September, 2018**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 : **Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Mukangan English School,
Parvati, Pune - 411009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme*

Registration Number : **MEDA/ECN/CR-05/2018-19/EA-03**

- 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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **31st March 2021** 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.


(Smita Kudarikar)
General Manager (EC)

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ACKNOWLEDGEMENT

We Enrich Consultants, Pune express our gratitude to the management of Progressive Education Society's Modern Law College, Pune for assigning us the power quality and electrical safety audit.

We are thankful to,

- ❖ Dr. Sunita Adhav, Principal
- ❖ Prof. Pawan Kalwala, Assistant Professor

Executive Summary

As per the study of the system conducted at the premises, we recommend the replacement of the following items. Detailed suggestion and recommendations are given in the subsequent report. This summary is the cumulative statement of the entire list of items to be changed or replaced.

No	Location	Particulars	Present Condition	Quantity	Recommendation	Priority Level
1	Main feeder pillar panel	Earthing Issue	No Earthing	2	Install chemical copper rod earthings	Immediately
2	Main feeder pillar panel	Flow of current in main Neutral	Neutral is weak	-	Install new earthing and short it with incomer neutral point	Immediately
3	MSEDCL main energy meter	Absence of protective shed	No shed	-	Install separate shed for meter	Immediately
4	First Floor kitkat Box	Kitkat box is open and joints are observed	Joints are observed	-	Avoid joints strictly, use disclosure for box and use cable trays for open wires	Immediately
5	First floor single pole MCB	MCB in hanging situation	In hanging situation	-	Fixed MCB properly with MCB box.	Immediately
6	Main LT panel	Joints, rubber mats and earthing issue and cleaning issue , ventilation issue	Joints are observed, no rubber mats, no earthing, unnecessary material observed, no ventilation	-	Avoid joints strictly, install rubber mats in panel room, install exhaust fan for ventilation, avoid keeping unnecessary material ,keep cleaning in panel room, Install separate earthing for feeders.	Immediately

Overview Of Electrical survey in College is as follows :

1. System load is unbalance, balance the load properly.
2. Earthing issue is observed, install new chemical earthings in premises.
3. Provide fire extinguisher in panel room area.
4. Check the termination regularly during maintenance schedule of college.

Chapter – I**General Description of College**

No	Head	Particulars
1	Name	PES's Modern Law College
2	Address	Pashan Road, Ganeshkhind, Pune
3	Year of Establishment	2003
4	Affiliation	Savitribai Phule Pune University

SCOPE of WORK

- Review the electrical safety aspects in the substations, electrical equipment's.
- Review of statutory electrical documents & records.
- Audit/Review of compliance to statutory requirements as per the Electricity act & the Indian Electricity Rules & relevant Indian standards & codes of practice.
- Review of Personal Protection Equipment's.
- Verification of periodical checking of the earthing as per IS-3043 and suggest suitable recording.
- Review and audit of preventive electrical maintenance.
- Review of corrective actions taken on last audit findings.
- Review of Electrical fire safety and need of training needs.

Important Definitions and Codes

1. Electrical Parameters

- Voltage(V)
- Current(A)
- Power(kW)
- Energy(kWh)
- Harmonics (V_{thd} and I_{thd})
- Power Factor
- Demand(kVA)
- Reactive Power (kVAR)

2. IS Codes:

Sr. No.	IS code	Remarks
1.	IS5216-1969	Guide for safety procedure & practices in electrical work
2.	IS3043:1987	Code for practice for earthing
3.	IS1886-1961	Code for practice for installation & maintenance of transformer
4.	IS 5424	Specification for electrical earth mat
5.	IS 5578:1984	Guide for making insulated conductors
6.	IS -3770	Specification for safety gloves

3. Temperature parameter (Thermographs)

PRIORITY CODE	TEMPERATURE LEVELS	ABNORMILITIES DESCRIPTION AND ACTION
5	UPTO 40°C	Normal. No action
4	40°C TO 60°C	Alert. Monitoring recommended

3	61°C TO 80°C	Severe . Rectification recommended during scheduled shutdown within 30 days.
2	81°C TO 100°C	Critical . Rectification recommended as soon as possible.
1	ABOVE 100°C	Immediate . Rectification immediate by taking shutdown

4. Earth Pit test values

Item	Value
Minor Sub-station	2 Ω
Neutral Bushing	2 Ω
Service connection	4 Ω
Medium Voltage Network	2 Ω
L.T. Pole	5 Ω
L.T. Lightning Arrestor	4 Ω

Treatments to for minimizing Earth resistance

- Remove Oxidation on joints and joints should be tightened.
- Poured sufficient salty water in earth electrode.
- Used bigger size of Earth Electrode.
- Electrodes should be connected in parallel.
- Earth pit of more depth & width- breadth should be made
- Mainly use Rod Earthing.

5. Insulation resistance test:

For 440V size of electrical equipment and megger size of 1000V the minimum resistance value 200 M Ω .

List of instruments used for the audit

Following instrument was used during the audit: -

Number	Instrument	Make	Model No	
1	3 Phase Energy analyzer	Fluke	434 II	
2	Thermal Imaging Camera	Testo	868	
3	Clamp On Meter	Rishabh	1000ACDC	
4	Earth tester	MECO	4680BLC	

Chapter – II

Power Quality Survey Report

RMS Voltage Values							
	Phase R-Y	Phase Y-B	Phase R-B	Phase R-N	Phase Y-N	Phase B-N	Ph N-G
Min Value	403.15	399.98	401.38	235.45	228.65	231.17	4.76
Ave Value	403.33	400.21	401.64	235.67	237.68	231.53	4.84
Max Value	403.50	400.43	401.89	235.88	229.67	231.87	4.92

RMS Current Values				
	Phase R	Phase Y	Phase B	Neutral
Min Value	12.68	6.54	1.30	9.66
Ave Value	12.72	6.55	1.34	9.71
Max Value	12.75	6.57	1.40	9.75

PEAK Current Values				
	Phase R	Phase Y	Phase B	Neutral
Min Value	26.04	11.59	3.61	19.89
Ave Value	26.43	11.79	3.93	20.17
Max Value	26.88	12.15	4.95	20.55

HARMONIC LEVEL IN %						
	Phase R	Phase Y	Phase B	Phase N	As per IEEE In %	As per MSEDCL in %
Voltage	3.60	3.54	3.38	195.73	Up to 5%	Up to 5 %
Current	45.99	10.48	67.73	77.08	Up to 10 %	Up to 10 %

Frequency	
Max	49.96
Avg	49.96
Min	49.96

Electrical Scenario of College:

A. Main LT Panel Room :



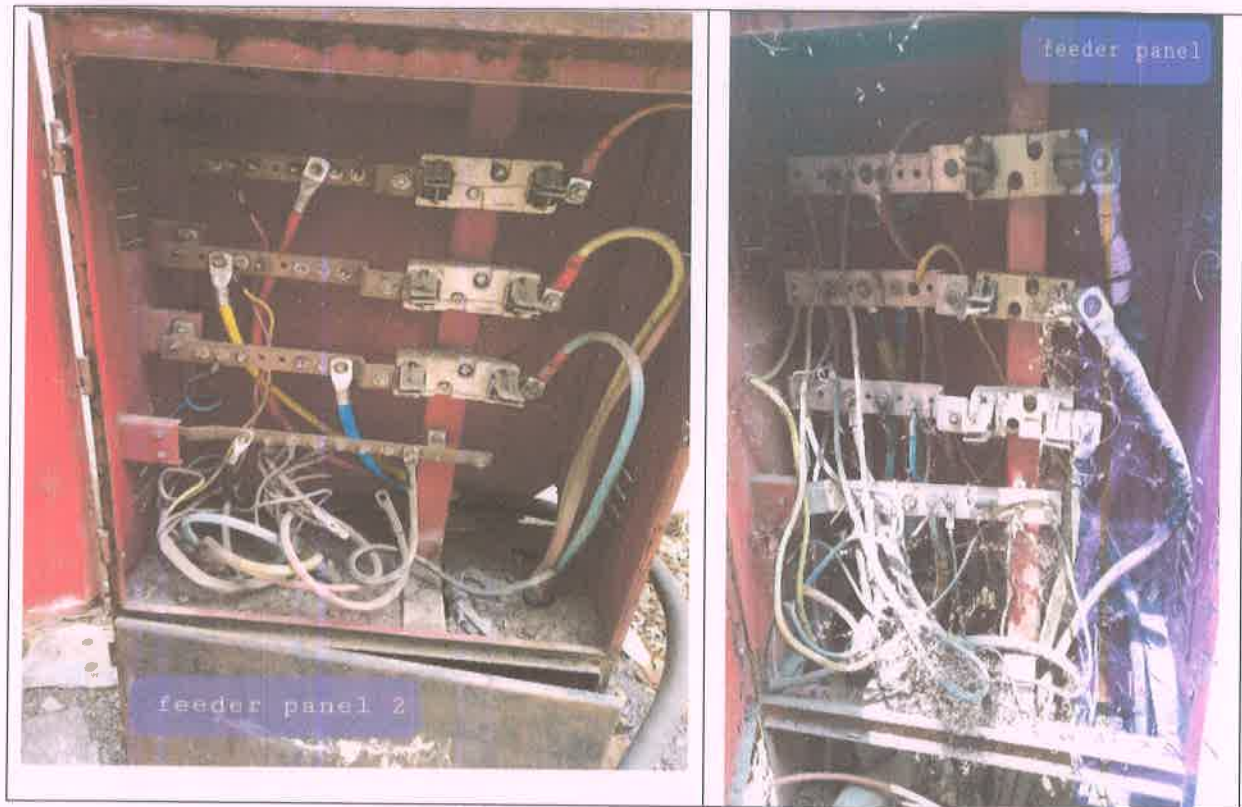
1. It is suggested that to keep the panel room always clean.
2. Remove unnecessary material in panel room for safety purpose.
3. Strictly avoid joints in cables and wires.
4. Check the termination of kitkat boxes and do proper creamping of lugs.
5. Open cabeling is observed, avoid it and use cable trays for proper cable laying.
6. Safety signs in panel room are absent.
7. Use rubber matts in panel room.
8. Keep fire extinguisher in panel room for safety purpose.
9. Earthings are absent. Install new dedicated chemical earthings mainly.

B. First Floor Kitkat Box and single pole MCB :



1. Kitkat boxes are open, use disclosures properly.
2. Joints are observed, avoid joints strictly.
3. Avoid open cabling. Use proper cable laying.
4. Check Electrical terminations regularly.
5. Keep fire extinguisher on floor for safety.
6. Single pole MCB on first floor is in hanging situation, Fixed it properly with MCB box mainly.

C. Feeder Pillar Panel :



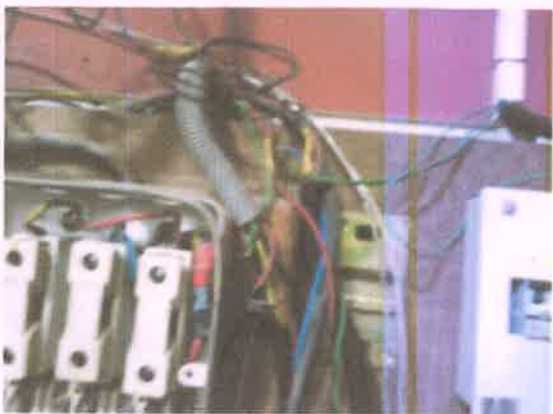
1. Condition of feeder pillar panel is very dangerous.
2. Cleaning is highly required in same feeder pillar panel.
3. Use damper taping for the termination of cable for insulation safety.
4. Gathering of large cables are observed, avoid it, use separate cable laying for same.
5. Check the termination of cables regularly during maintenance schedule.
6. Cable entry glands are absent, use cable entry glands properly.
7. Earthings are absent. Install new dedicated chemical earthings mainly.

Thermography

File:
IR000073.BMT

Date:
18-Mar-21

Time:
12:47:39 PM



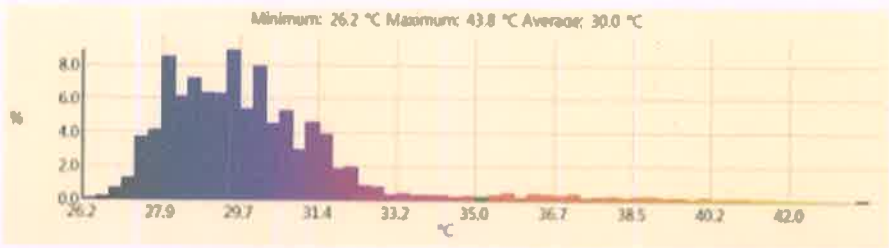
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Emissivity:	0.95	Electric current [A]:	0.0
Refl. temp. [°C]:	20.0	Electric voltage [V]:	430.0
		Electric power [W]:	0

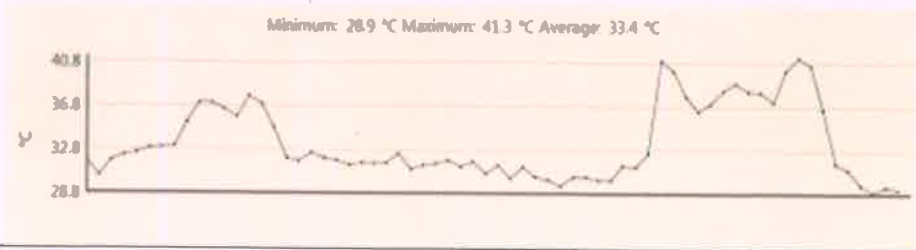
Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Measure point 1	29.3	0.95	20.0	CenterSpot
Cold spot 1	26.2	0.95	20.0	Cold Spot
Hot spot 1	43.8	0.95	20.0	Hot Spot

Histogram:



Profile line:



Remarks:

Location:-Kitkat box in Main LT panel room.
Check the termination of kitkat boxes regularly and avoid joints.

File:
IR000074.BMT

Date:
18-Mar-21

Time:
12:48:05 PM



Picture parameters:

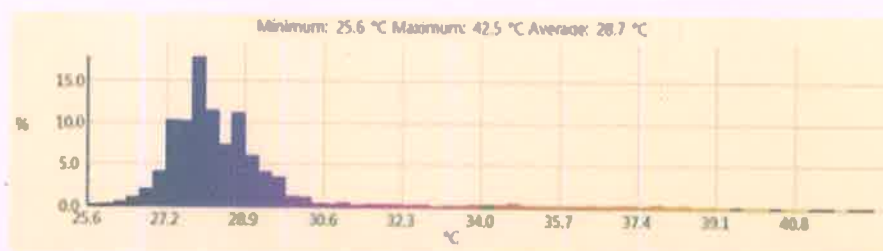
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Refl. temp. [°C]: 20.0

Electric current [A]: 0.0
Electric voltage [V]: 430.0
Electric power [W]: 0

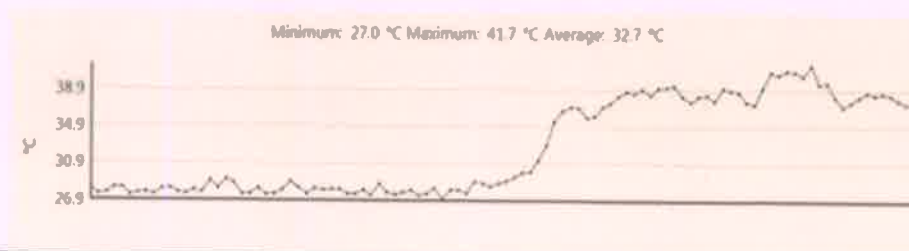
Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Measure point 1	27.7	0.95	20.0	CenterSpot
Cold spot 1	25.4	0.95	20.0	Cold Spot
Hot spot 1	42.5	0.95	20.0	Hot Spot

Histogram:



Profile line:



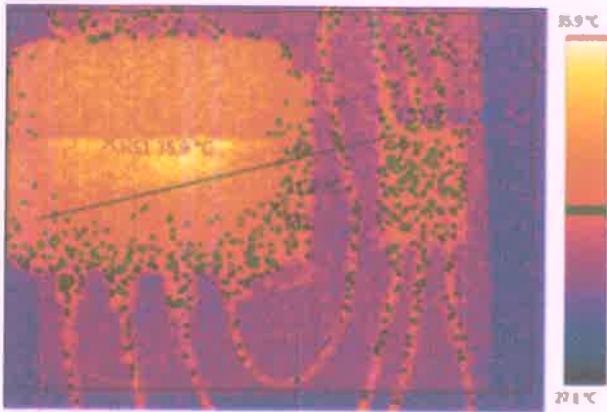
Remarks:

Location :- Kitkat box armoured cable in Main LT Panel room.
Joints are observed for neutral cable, avoid joints strictly and check the termination properly.

File:
IR000072.BMT

Date:
18-Mar-21

Time:
12:41:21 PM



Picture parameters:

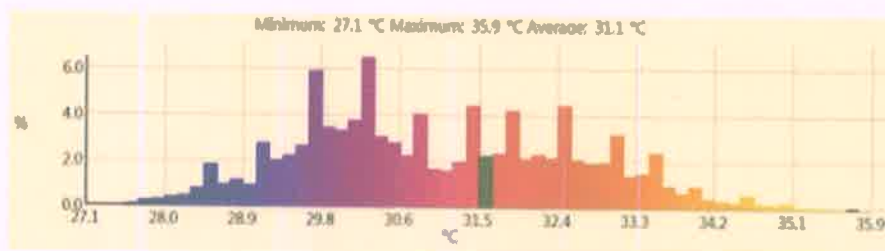
Emissivity: 0.95
Refl. temp. [°C]: 20.0

Electric current [A]: 0.0
Electric voltage [V]: 430.0
Electric power [W]: 0

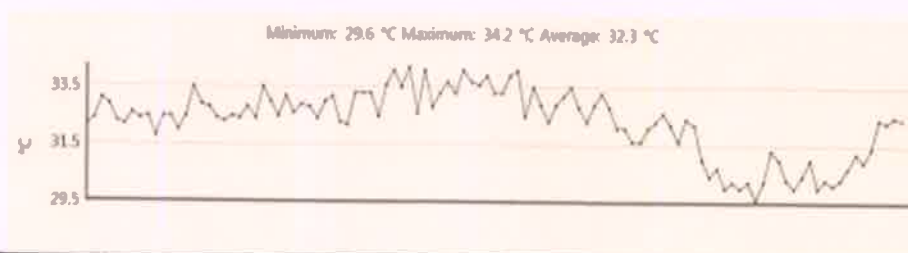
Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Measure point 1	31.2	0.95	20.0	CenterSpot
Cold spot 1	27.1	0.95	20.0	Cold Spot
Hot spot 1	35.9	0.95	20.0	Hot Spot

Histogram:



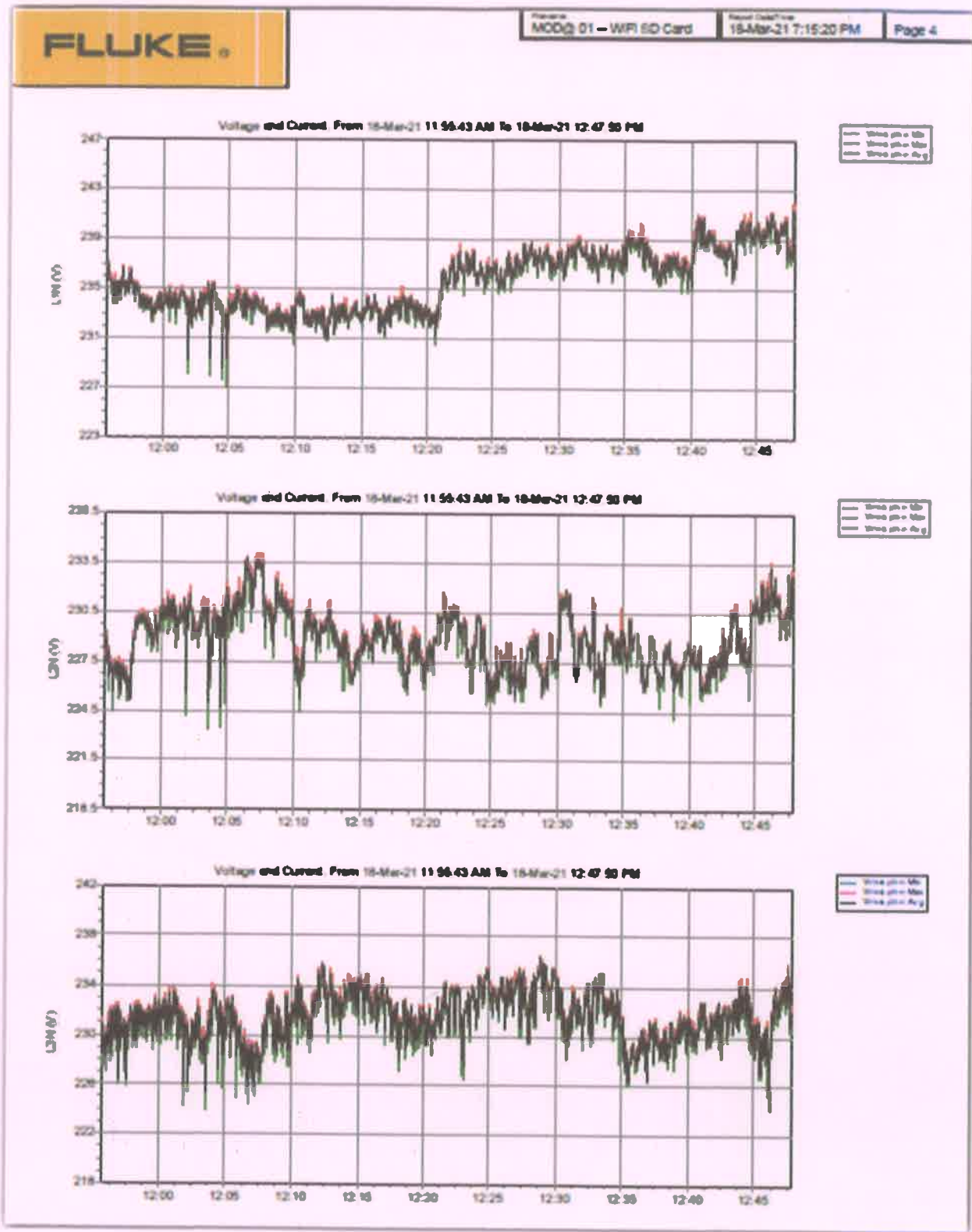
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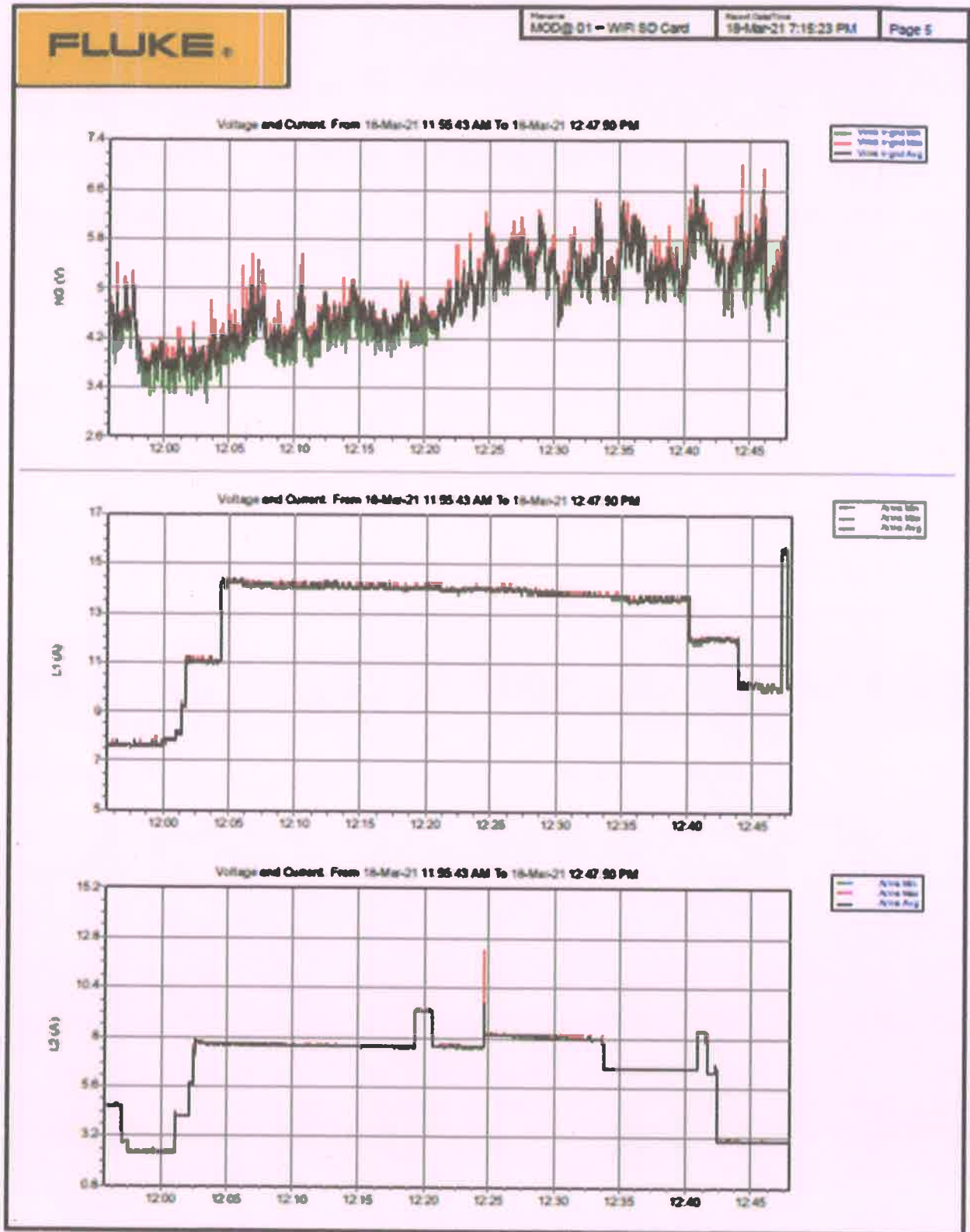


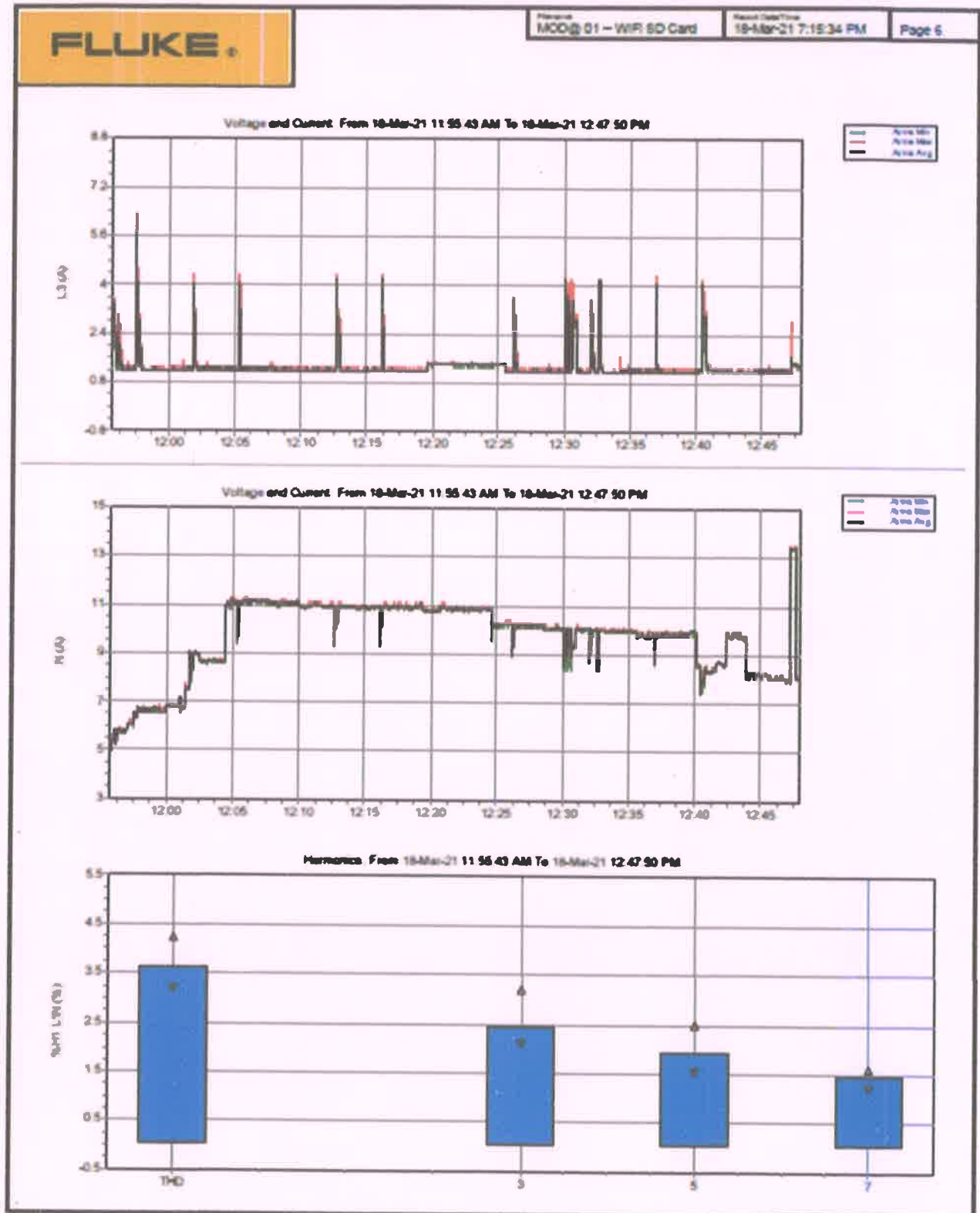
Remarks:

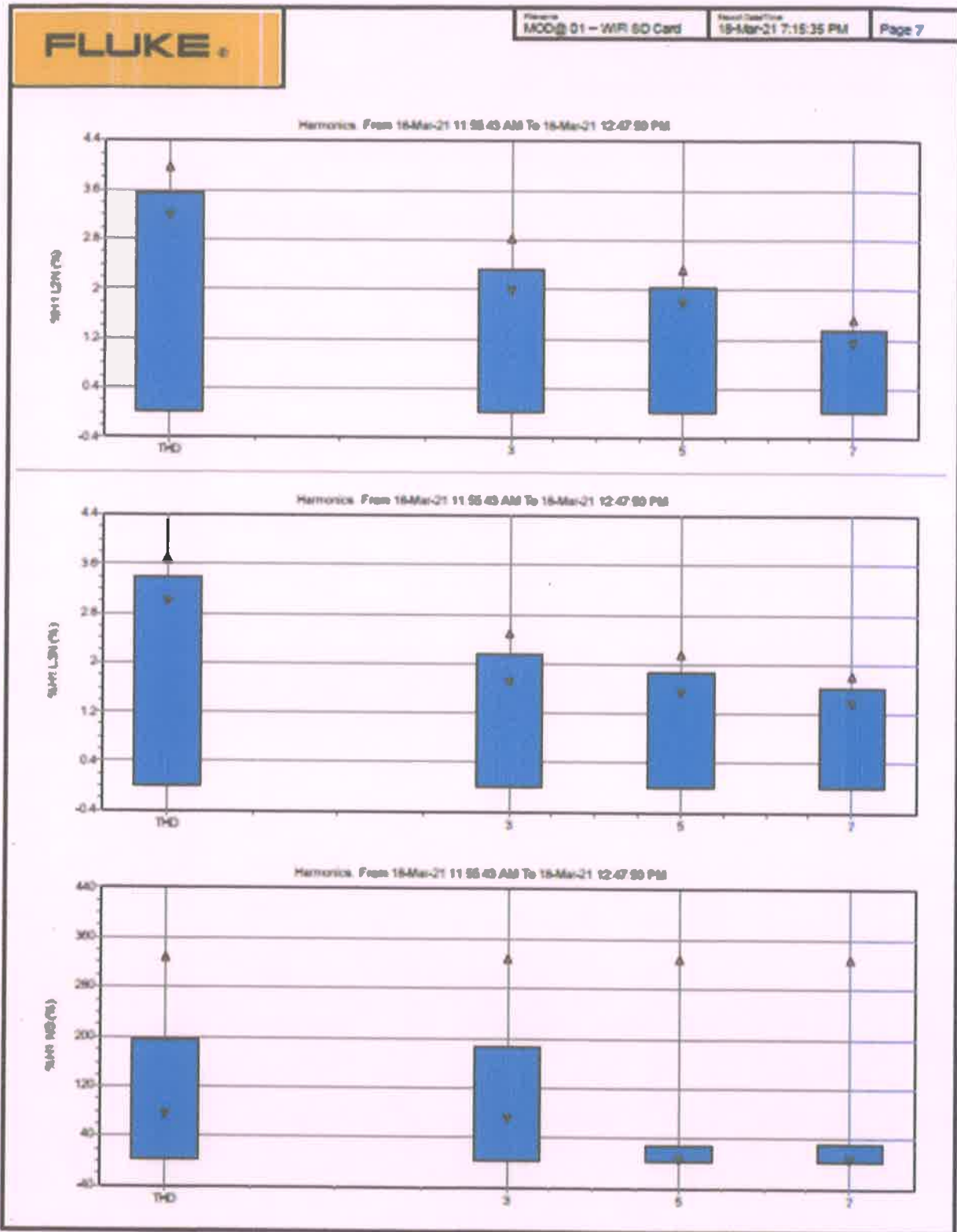
Location :- Electrical Energy Meter
Install seprate protective shed for energy meter for safety purpose,

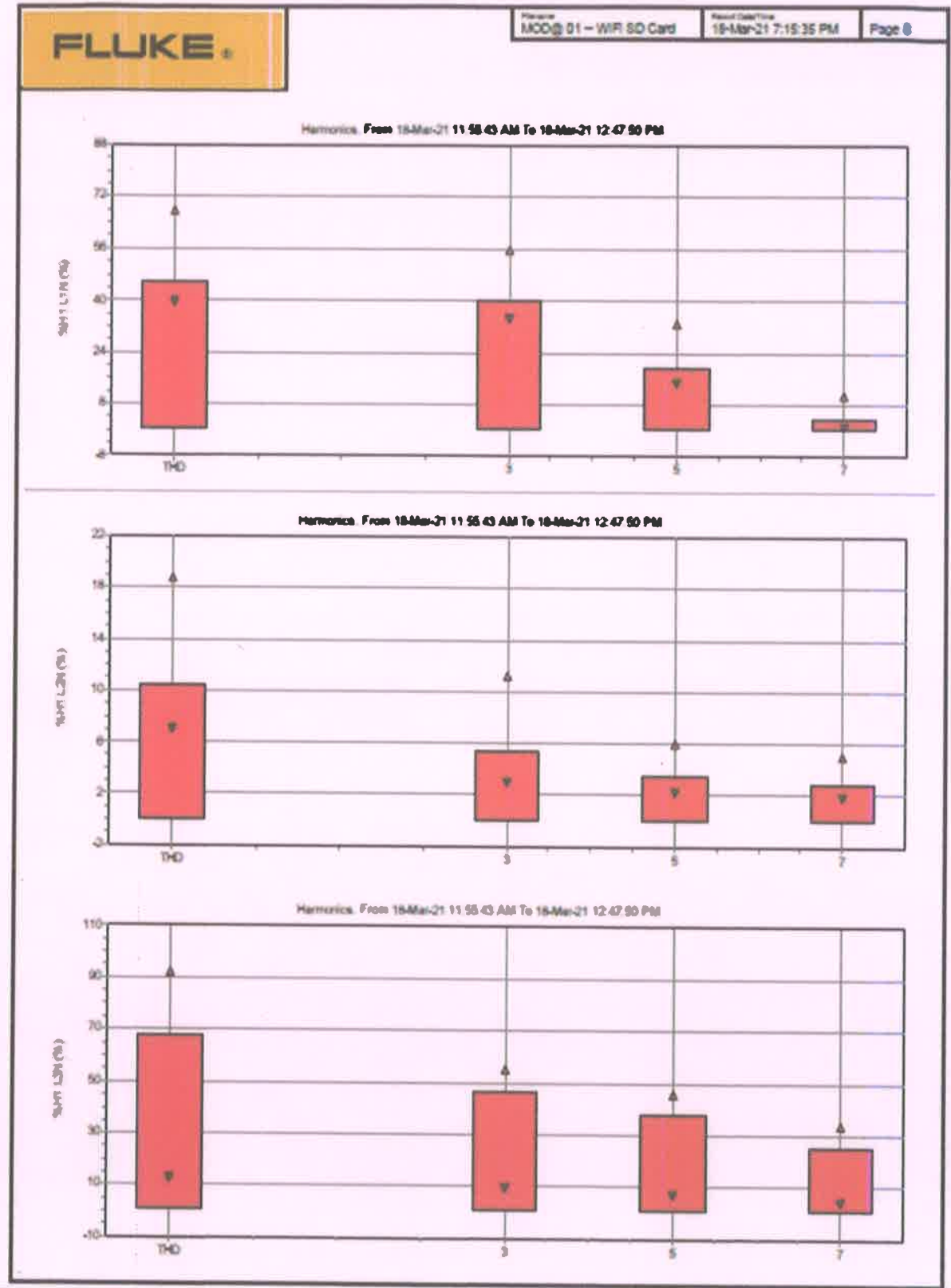
Graph

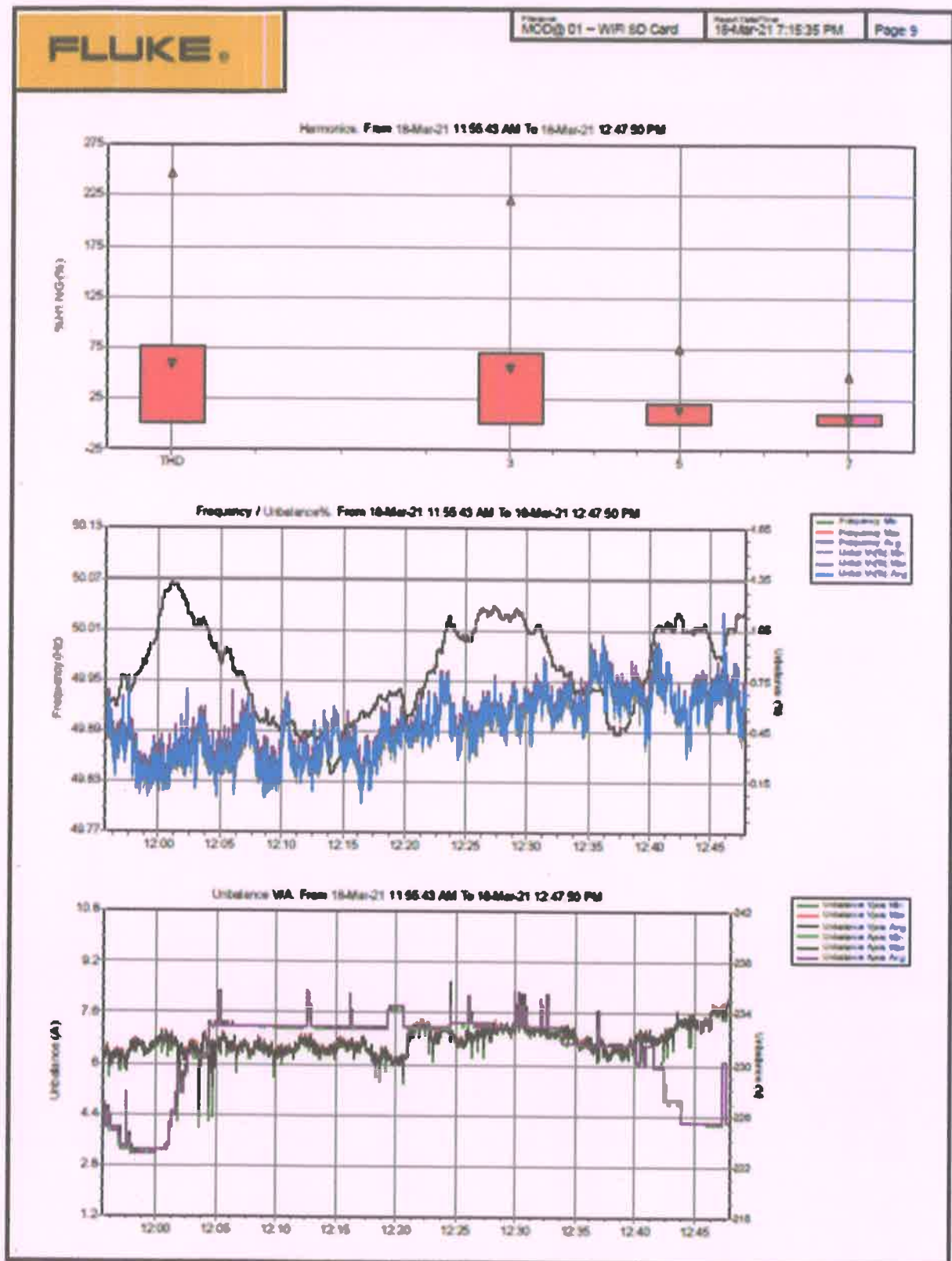












ENERGY AUDIT REPORT
Of
Progressive Education Society's
Modern Law College,
Pashan Road, Ganeshkhind, Pune



Year: 2019-20

Prepared by

Enrich Consultants,
Yashashree, 26, Nirmal Bag Society,
Near Mukhtangan English School, Parvati, Pune 411009
Phone: 09890444795 Email: enrichcons@gmail.com



MAHARASHTRA ENERGY DEVELOPMENT AGENCY



Maharashtra Energy Development Agency

(A Government of Maharashtra undertaking)

2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006,
Ph No: 020-26614393/266144403

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

ECN/2018-19/CR-05/4174

19th September, 2018

**CERTIFICATE OF REGISTRATION
FOR CLASS 'A'**

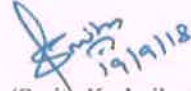
We hereby certify that, the firm having following particulars is registered with **MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : **Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Mukangan English School,
Parvati, Pune - 411009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme*

Registration Number : **MEDA/ECN/CR-05/2018-19/EA-03**

- 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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **31st March 2021** 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.


(Smita Kudarikar)
General Manager (EC)

Enrich Consultants

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

Ref: EC/PEMLC/01

Date: 20/8/2020

CERTIFICATE

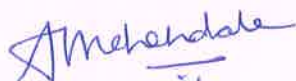
This is to certify that we have conducted Energy Audit at Progressive Education Society's Modern Law College, Ganeshkhind, Pune in the year 2019-20.

The College has already adopted **Energy Efficient** practices like:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of **5 kW** Hybrid Roof Top Solar PV/Wind Power Plant.

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

For Enrich Consultants,



A Y Mehendale,
Certified Energy Auditor
EA-8192



INDEX

Sr. No	Particulars	Page No
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3	Study of Electrical Energy Consumption	12
4	Carbon Foot printing	14
5	Study of Usage of Alternate Energy	16
6	Study of Usage of LED Lights	17

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of Progressive Education Society's Modern Law College, for awarding us the assignment of Energy Audit of their Ganeshkhind campus for the Year: 2019-20.

We are thankful to:

- Dr Sunita Adhav, Principal
- Prof Pawan Kalwala, Assistant Professor

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

EXECUTIVE SUMMARY

1. **Progressive Education Society's Modern Law College, Ganeshkhind, Pune** consumes Energy in the form of **Electrical Energy** used for various gadgets, Office & other facilities.

2. Present Level of Energy Consumption:

No	Parameter/ Value	Energy consumed, kWh	CO ₂ emissions, MT
1	Total	22067	17.65
2	Maximum	2112	1.69
3	Minimum	1721	1.38
4	Average	1838.9	1.47

3. Various Majors Adopted for Energy Conservation:

The various projects already implemented by the College are

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated ACs
- Installation of 5 kWp Roof top Solar PV Plant

4. Study of Usage of Alternate Energy:

The College has installed 5 kWp Roof Top Solar PV Plant. The Energy purchased from MSEDCL is 22067 kWh, while the Energy generated 6000 kWh. The % of Usage of Alternate Energy to Annual Energy Demand works out to be 21.38 %.

5. Study of Usage of LED Lighting:

The College has various types of fittings, namely 40W FTL and LEDs. The percentage of usage of LED to the total annual lighting power requirement works out to be 48.72 %

6. Notes & Assumptions:

1. 1 Unit of Electrical Energy releases 0.8 Kg of CO₂ into atmosphere
2. 1 kWp Solar PV system generates 4 Units (kWh) of Electrical Energy per Day
3. Daily working hours-5 Nos (For Lighting Requirement Calculations)
4. Annual working Days-280 Nos

ABBREVIATIONS

AC	: Air conditioner
CFL	: Compact Fluorescent Lamp
FTL	: Fluorescent Tube Light
LED	: Light Emitting Diode
kWh	: kilo-Watt Hour
Qty	: Quantity
W	: Watt
kW	: Kilo Watt
PF	: Power Factor
M D	: Maximum Demand
PC	: Personal Computer
MT	: Metric Ton

CHAPTER-I

INTRODUCTION

1.1 Objectives:

1. To study present level of Energy Consumption
2. To Study the present CO₂ emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study Usage of Renewable Energy
5. To study Usage of LED Lighting

1.2 Table No-1: General Details of College:

No	Head	Particulars
1	Name	PES's Modern Law College
2	Address	Pashan Road, Ganeshkhind, Pune
3	Year of Establishment	2003
4	Affiliation	Savitribai Phule Pune University

CHAPTER-II

STUDY OF CONNECTED LOAD

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

2.1 Table No-2: Details of Overall Connected Load:

No	Location	40 W FTL	22W LED	20W LED	12W LED	FAN	AC	PC
	Ground Floor							
1	Entrance		3	1				
2	Office	1	4			4	1	5
3	Passage			2		1		
4	Staff Room			2		2	1	6
5	Sick Room			1		1		
6	Exam Control Room		2			1		1
7	LLM Department				4	1		1
8	Outside LLM Dept			1		1		
9	Pantry	1						
10	IQAC Conference Hall			4	6	1	1	
11	Principal Room		1		6	1	1	1
12	Ladies Toilet			3				
12	Gents Toilet			1				
13	Vice Principal Cabin			1		1		
14	Outside Library		2	5				
15	Reading Hall		29			8		
16	Toilet			1				
17	Parking			4				
18	Passage			1				
19	Legal Research Center		8			2		9
20	Books Room		20			4		
21	L-1	5				2		
22	L-2	3				3		
23	L-3	6				2		
24	Store Room			1				
25	NSS Room		4			2		
26	Gym	4				3		
27	Legal Aid Center		6					

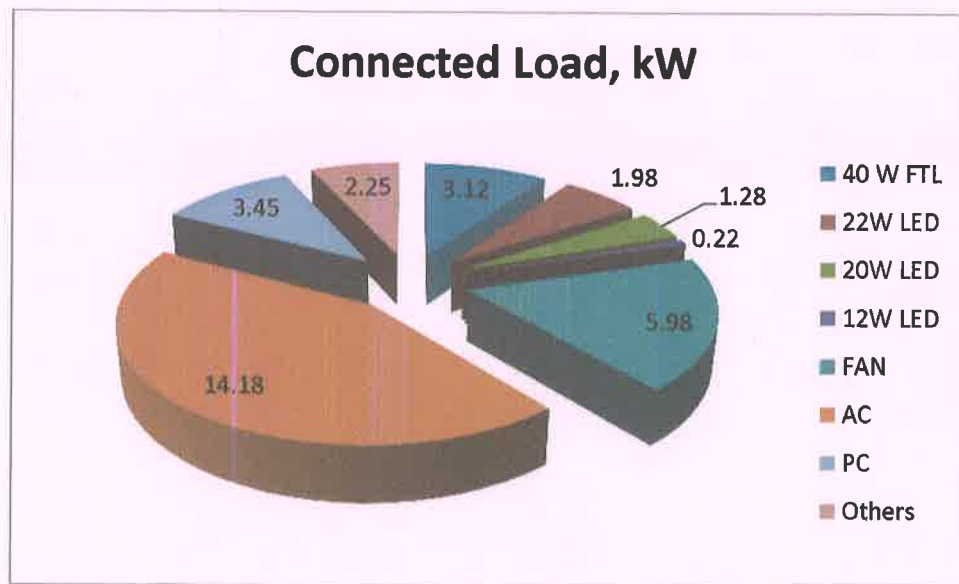
	First Floor							
No	Location							
1	Staircase			1				
2	Placement Cell					1		
3	Passage			2				
4	L-4			8		4		
5	L-5			7		5		
6	Moot Court Hall	8	1		2	6	3	
7	Passage			3				
8	Ladies Toilet		6			1		
9	Gents Toilet		4	1		1		
10	L-6			5		5		
11	L-7			6		5		
	Second Floor							
No	Location							
1	Passage	7		1				
2	L-8	4		1		3		
3	L-9	5				3		
4	L-10	5				6		
5	Ladies Toilet	3		1		3		
6	Gents Toilet	2						
	Third Floor							
No	Location							
1	Passage	2						
2	L-11	6				3		
3	L-12	6				3		
4	L-13	6				3		
5	Ladies Toilet	2						
6	Gents Toilet	2						
	Total	78	90	64	18	92	7	23

Now we present the connected load- Equipment wise in the following Table.

Table No-3: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL	78	40	3.12
2	22W LED	90	22	1.98
3	20W LED	64	20	1.28
4	12W LED	18	12	0.22
5	FAN	92	65	5.98
6	AC	7	2025	14.18
7	PC	23	150	3.45
8	Others	15	150	2.25
9	Total			32.45

Chart No-1: Details of Connected Load:



CHAPTER-III

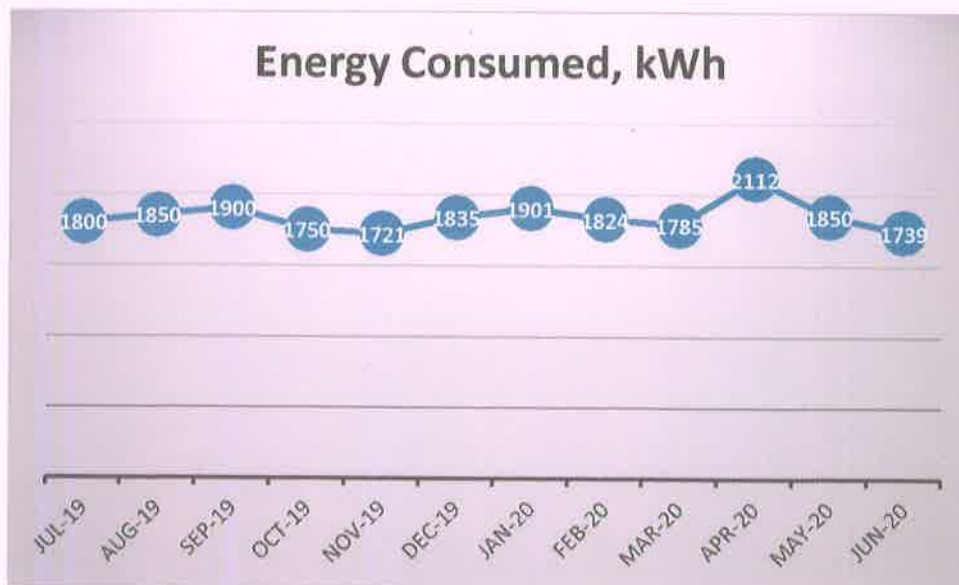
STUDY OF ELECTRICAL ENERGY CONSUMPTION

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

Table No 4: Electrical Energy Consumption Analysis- 2019-20:

No	Month	Energy Consumed, kWh
1	Jul-19	1800
2	Aug-19	1850
3	Sep-19	1900
4	Oct-19	1750
5	Nov-19	1721
6	Dec-19	1835
7	Jan-20	1901
8	Feb-20	1824
9	Mar-20	1785
10	Apr-20	2112
11	May-20	1850
12	Jun-20	1739
13	Total	22067
14	Maximum	2112
15	Minimum	1721
16	Average	1838.9

3.1.1 Chart No-2: To study the variation of Month wise Energy Consumption, kWh:



Key observations:

Table No 5: Important parameters:

No	Parameter	Energy consumed, kWh
1	Total	22067
2	Maximum	2112
3	Minimum	1721
4	Average	1838.9

CHAPTER-IV

CARBON FOOTPRINTING

4.1 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 College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets.

4.2 Basis for computation of CO₂ Emissions:

The basis of Calculation for CO₂ emissions due to Electrical Energy are: 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO₂** into atmosphere

Based on the above Data we compute the CO₂ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

4.3 Table No 6: Month wise CO₂ Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jul-19	1800	1.44
2	Aug-19	1850	1.48
3	Sep-19	1900	1.52
4	Oct-19	1750	1.40
5	Nov-19	1721	1.38
6	Dec-19	1835	1.47
7	Jan-20	1901	1.52
8	Feb-20	1824	1.46
9	Mar-20	1785	1.43
10	Apr-20	2112	1.69
11	May-20	1850	1.48
12	Jun-20	1739	1.39
13	Total	22067	17.65
14	Maximum	2112	1.69
15	Minimum	1721	1.38
16	Average	1838.9	1.47

4.4 Chart No-3: Representation of Month wise CO₂ emissions:

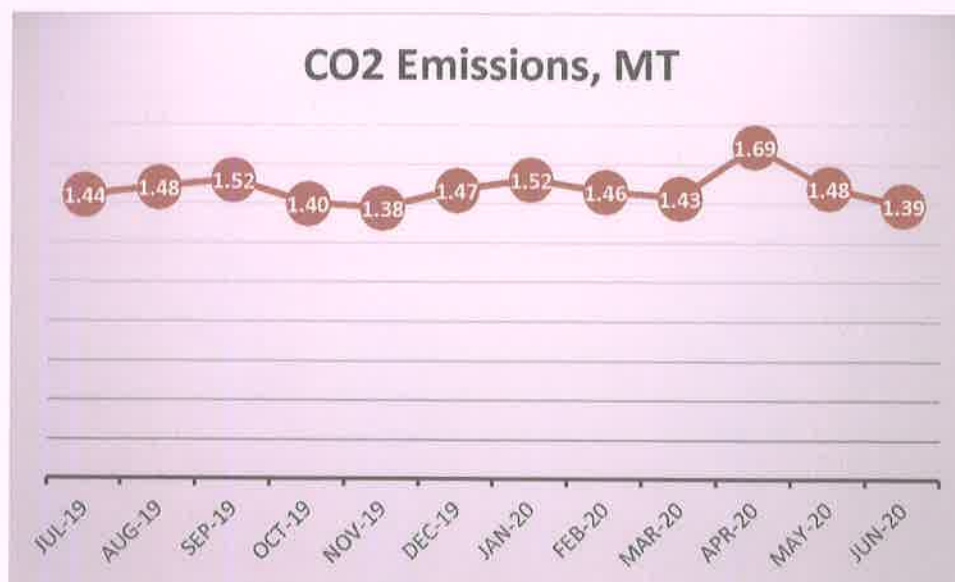


Table No 7: Key observations:

No	Parameter	Energy consumed, kWh	CO2 emissions, MT
1	Total	22067	17.65
2	Maximum	2112	1.69
3	Minimum	1721	1.38
4	Average	1838.9	1.47

CHAPTER-V

STUDY OF USAGE OF ALTERNATE ENERGY

The College has installed 5 kWp Roof Top Solar PV Plant.

In the following Table, we compute the % usage of Alternate Energy to Annual Energy Demand.

Table No 8: Computation of % Usage of Alternate Energy:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Capacity	5	kWp
2	Average Daily Energy generated per kWp	4	kWh/kWp
3	Annual Energy Generation Days	300	Nos
4	Annual Energy Generated by Solar PV Plant	6000	kWh
5	Energy purchased from MSEDCL	22067	kWh
6	Total Energy Requirement = (4) + (5)	28067	kWh
7	% of Usage of Alternate Energy to Annual Energy Demand = $(4) * 100 / (6)$	21.38	%

Photograph of Roof Top Solar PV Plant:



CHAPTER-VI

STUDY OF USAGE OF LED LIGHTING

The College has about 78 Nos 40 W FTL fittings & LED fittings. In the following Table, we present the percentage of usage of LED lights to the annual Lighting power requirement.

Table No-9: Study of Lighting Load:

No	Particulars	Value	Unit
1	Qty of 40 W FTL	78	Nos
2	Load/Unit of 40 W FTL	40	W/Unit
3	Total Load of 40 W FTL fittings	3.12	kW
4	Qty of 12 W LED fitting	18	Nos
5	Load/Unit of 12 W LED fitting	12	W/Unit
6	Total Load of 12 W LED fittings	0.216	kW
7	Qty of 20 W LED fitting	64	Nos
8	Load/Unit of 20 W LED fitting	12	W/Unit
9	Total Load of 20 W LED fittings	0.768	kW
10	Qty of 22 W LED fitting	90	Nos
11	Load/Unit of 22 W LED fitting	22	W/Unit
12	Total Load of 22 W LED fittings	1.98	kW
13	Total Lighting Load=3+6+9+12	6.084	kW
14	Total LED Lighting Load=6+9+12	2.964	kW
15	Daily Operating period	5	Hrs
16	Annual Operating Days	280	Nos
17	Annual Total Lighting power required	8517.6	kWh/Annum
18	Annual LED Power required	4149.6	kWh/Annum
19	% of LED lighting to Total Annual Lighting Requirement	48.72	%

GREEN AUDIT REPORT
Of
Progressive Education Society's
Modern Law College,
Pashan Road, Ganeshkhind, Pune



Year: 2019-20

Prepared by

Enrich Consultants,
Yashashree, 26, Nirmal Bag Society
Near Mukhtangan English School, Parvati, Pune 411009
Cell: 09890444795 Email: enrichcons@gmail.com



MAHARASHTRA ENERGY DEVELOPMENT AGENCY



Maharashtra Energy Development Agency

(A Government of Maharashtra undertaking)

2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006,

Ph No: 020-26614393/266144403

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

ECN/2018-19/CR-05/4174

19th September, 2018

**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 : **Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Mukhtangan English School,
Parvati, Pune - 411009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme*

Registration Number : **MEDA/ECN/CR-05/2018-19/EA-03**

- 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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **31st March 2021** 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.

(Smita Kudarikar)
General Manager (EC)

Enrich Consultants

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

Ref: EC/PESMLC/02

Date: 20/8/2019

CERTIFICATE

This is to certify that we have conducted **Green Audit** at Progressive Education Society's Modern Law College, Ganeshkhind, Pune in the year 2019-20.

The College has already adopted following projects for making the campus **Energy Efficient Efficient and Green:**

- Installation of 5 kW Roof Top Solar PV Power Plant.
- Installation of Bio Composting Tumbler Unit
- Installation of Rain Water Harvesting System
- Maintenance of good Internal Roads
- Maintenance of Garden in the Campus
- Usage of Energy Efficient LED Lighting
- Usage of BEE STAR Rated equipment

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

For Enrich Consultants,



A Y Mehendale,
Certified Energy Auditor
EA-8192



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4	Study of Usage of Renewable Energy	14
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6	Study of Rain Water Harvesting	16
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ACKNOWLEDGEMENT

We at Enrich Consultants, Pune, express our sincere gratitude to the management of Progressive Education Society's Modern Law College, for awarding us the assignment of Green Audit of their Ganeshkhind campus for the Year: 2019-20.

We are thankful to:

- Dr Sunita Adhav, Principal
- Prof Pawan Kalwala, Assistant Professor

We are also thankful to various Head of Departments & other Staff members for helping us during the field study.

EXECUTIVE SUMMARY

1. **Modern Law College, Ganeshkhind, Pune** consumes Energy in the form of **Electrical Energy** used for various gadgets, Office & other facilities.

2. Present Level of Energy Consumption:

No	Parameter/ Value	Energy consumed, kWh	CO ₂ emissions, MT
1	Total	22067	17.65
2	Maximum	2112	1.69
3	Minimum	1721	1.38
4	Average	1838.9	1.47

3. Various Majors Adopted for Energy Conservation:

The various projects already implemented by the College are

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated ACs
- Installation of 5 kWp Roof top Solar PV Plant

4. Usage of Renewable Energy:

The College has installed **5 kWp** Roof Top Solar PV Plant. The Energy generated by the Plant is **6000 kWh** per annum. The Reduction in CO₂ Emissions is **4.8 MT** per annum.

5. Waste Management:

5.1 Solid Waste Management:

The waste generated is segregated at source. The bio degradable waste is composted in a Bio composting tumbler unit and the fertilizer is used for own garden.

5.2 E-Waste Management:

All the internal communication is through emails and hardly any e-Waste is generated in the Day to Day operation of the College.

6. Rain Water Harvesting:

The College has already installed **Rainwater Harvesting System** to collect the Rain Water collected at the Terrace which is used for enriching the ground water level.

7. Green Practices:

- Maintenance of Good internal roads
- Maintenance of Landscaped garden

8. Notes & Assumptions:

1. 1 Unit of Electrical Energy releases **0.8 Kg of CO₂** into atmosphere
2. **1 kWp** Solar PV system generates **4 Units (kWh)** of Electrical Energy per Day
3. Daily working hours-**8** Nos
4. Annual working Days-**280** Nos

ABBREVIATIONS

AC	: Air conditioner
CFL	: Compact Fluorescent Lamp
FTL	: Fluorescent Tube Light
LED	: Light Emitting Diode
kWh	: kilo-Watt Hour
Qty	: Quantity
W	: Watt
kW	: Kilo Watt
PF	: Power Factor
M D	: Maximum Demand
PC	: Personal Computer
MT	: Metric Ton

CHAPTER-I

INTRODUCTION

1.1 Objectives:

1. To study present level of Energy Consumption
2. To Study the present CO₂ emissions
3. To study Scope for usage of Renewable Energy
4. To study Waste Management
5. To study rain water harvesting
6. To stud Green Practices

1.2 Table No-1: General Details of College:

No	Head	Particulars
1	Name	PES's Modern Law College
2	Address	Pashan Road, Ganeshkhind, Pune
3	Year of Establishment	2003
4	Affiliation	Savitribai Phule Pune University

CHAPTER-II

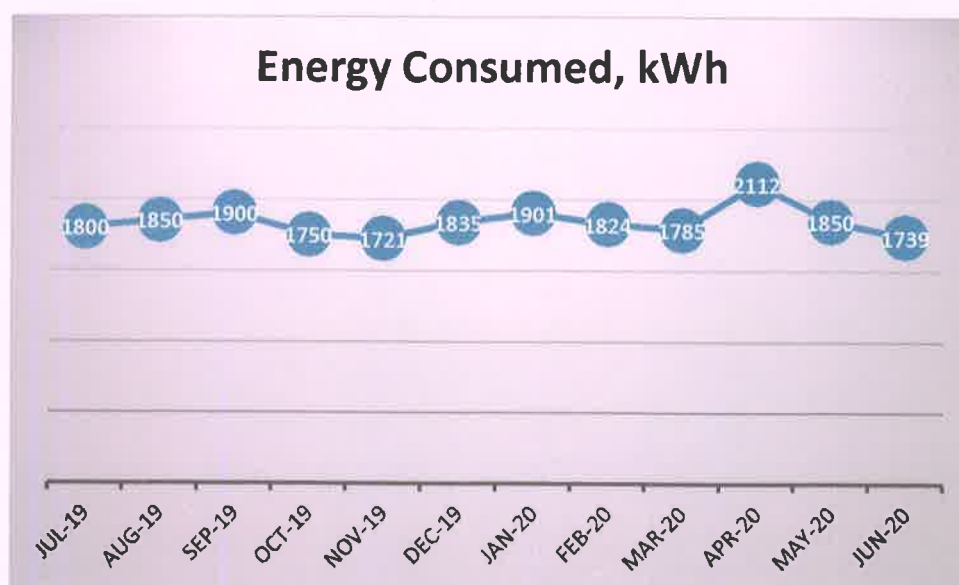
STUDY OF ELECTRICAL ENERGY CONSUMPTION

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

Table No 2: Electrical Energy Consumption Analysis- 2019-20:

No	Month	Energy Consumed, kWh
1	Jul-19	1800
2	Aug-19	1850
3	Sep-19	1900
4	Oct-19	1750
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6	Dec-19	1835
7	Jan-20	1901
8	Feb-20	1824
9	Mar-20	1785
10	Apr-20	2112
11	May-20	1850
12	Jun-20	1739
13	Total	22067
14	Maximum	2112
15	Minimum	1721
16	Average	1838.9

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



Key observations:

Table No 3: Important parameters:

No	Parameter	Energy consumed, kWh
1	Total	22067
2	Maximum	2112
3	Minimum	1721
4	Average	1838.9

CHAPTER-III

CARBON FOOTPRINTING

3.1 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 College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets.

3.2 Basis for computation of CO₂ Emissions:

The basis of Calculation for CO₂ emissions due to Electrical Energy are: 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO₂** into atmosphere

Based on the above Data we compute the CO₂ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

3.3 Table No 4: Month wise CO₂ Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jul-19	1800	1.44
2	Aug-19	1850	1.48
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13	Total	22067	17.65
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15	Minimum	1721	1.38
16	Average	1838.9	1.47

Chart No 2: Representation of Month wise CO₂ emissions:

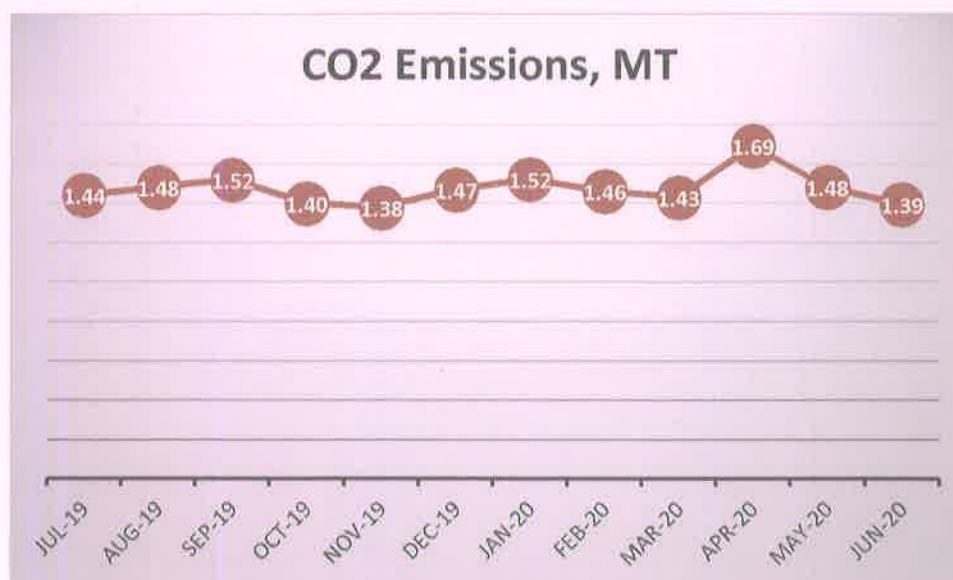


Table No 5: Key observations:

No	Parameter	Energy consumed, kWh	CO ₂ emissions, MT
1	Total	22067	17.65
2	Maximum	2112	1.69
3	Minimum	1721	1.38
4	Average	1838.9	1.47

CHAPTER-IV

STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed 5 kWp Roof Top Solar PV Plant.

In the following Table, we compute the Energy generated and reduction in CO₂ Emissions.

Table No 6: Computation of Reduction in CO₂ Emissions due to 5 kWp Solar PV Plant:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Capacity	5	kWp
2	Average Daily Energy generated per kWp	4	kWh/kWp
3	Annual Energy Generation Days	300	Nos
4	Annual Energy Generated by Solar PV Plant	6000	kWh
5	1 kWh of Electrical Energy is equivalent to	0.8	Kg of CO ₂
6	Reduction in Annual CO ₂ Emission = (0.8) * (4) /1000	4.8	MT

Photograph of Roof Top Solar PV Plant:



CHAPTER V

STUDY OF WASTE MANAGEMENT

5.1 Solid Waste Management:

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

Photograph of Bio Composting Storage Tanks:



5.2 E-Waste Management:

The internal communication is through emails and hence there is hardly any generation of E-Waste in the premises.

CHAPTER-VI

STUDY OF RAIN WATER HARVESTING

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

Photograph of Rain Water Harvesting Pipe:



CHAPTER-VII

STUDY OF GREEN PRACTICES

7.1 Pedestrian Friendly Roads:

The College has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

Photograph of Internal Road:



7.2 Paperless Office:

The internal communication of the College is through the Internet. There are hardly any day to day operations, where printing is required. It is recommended to reduce the consumption of papers by setting a target of 5 % reduction every year.

7.3 Green Landscaping with Trees and Plants:

Photograph of Internal Garden:



ENVIRONMENTAL AUDIT REPORT

Of

Progressive Education Society's
Modern Law College,
Pashan Road, Ganeshkhind, Pune



Year: 2019-20

Prepared by

Enrich Consultants,
Yashashree, 26, Nirmal Bag Society
Near Mukhtangan English School, Parvati, Pune 411009
Cell: 09890444795 Email: enrichcons@gmail.com



MAHARASHTRA ENERGY DEVELOPMENT AGENCY



Maharashtra Energy Development Agency

(A Government of Maharashtra undertaking)

2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006,

Ph No: 020-26614393/266144403

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

ECN/2018-19/CR-05/4174

19th September, 2018

**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	Enrich Consultants Yashashree, Plot No. 26, Nirmal Bag Society, Near Mukangan English School, Parvati, Pune - 411009.
Registration Category	Empanelled <i>Consultant for Energy Conservation Programme</i>
Registration Number	MEDA/ECN/CR-05/2018-19/EA-03

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(Smita Kudarikar)
General Manager (EC)

Enrich Consultants

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

Ref: EC/PESMLC/03

Date: 20/8/2020

CERTIFICATE

This is to certify that we have conducted **Environmental Audit** at Progressive Education Society's Modern Law College, Ganeshkhind, Pune in the year 2019-20.

The College has already adopted following practices for making the campus **Environmentally Friendly**:

- Installation of 5 kW Hybrid Roof Top Solar PV/Wind Power Plant.
- Installation of Bio Composting Tumbler Unit
- Installation of Rain Water Harvesting System
- Maintenance of internal Garden
- Usage of Energy Efficient LED Lighting

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

For Enrich Consultants,


A Y Mehendale,
Certified Energy Auditor
EA-8192



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4	Study of CO ₂ Mitigation	14
5	Study of Waste Management	15
6	Study of Rain Water Harvesting	16

ACKNOWLEDGEMENT

We at Enrich Consultants, Pune, express our sincere gratitude to the management of Progressive Education Society's Modern Law College, for awarding us the assignment of Environmental Audit of their Ganeshkhind campus for the Year: 2019-20.

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- Prof Pawan Kalwala, Assistant Professor

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4	Average	1838.9	1.47

3. Various Majors Adopted for Energy Conservation:

The various projects already implemented by the College are

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated ACs
- Installation of 5 kWp Roof top Solar PV Plant

4. Usage of Renewable Energy:

The College has installed 5 kWp Roof Top Solar PV Plant. The Annual Energy generated is 6000 kWh. The annual reduction in CO₂ Emissions is 4.8 MT.

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The waste generated is segregated at source. The bio degradable waste is composted in a Bio composting tumbler unit and the fertilizer is used for own garden.

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7. Notes & Assumptions:

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2. 1 kWp Solar PV system generates **4 Units (kWh)** of Electrical Energy per Day
3. Daily working hours-**8** Nos
4. Annual working Days-**280** Nos

ABBREVIATIONS

AC	: Air conditioner
CFL	: Compact Fluorescent Lamp
FTL	: Fluorescent Tube Light
LED	: Light Emitting Diode
kWh	: kilo-Watt Hour
Qty	: Quantity
W	: Watt
kW	: Kilo Watt
PF	: Power Factor
M D	: Maximum Demand
PC	: Personal Computer
MT	: Metric Ton

CHAPTER-I

INTRODUCTION

1.1 Important Definitions:

1.1.1 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

1.1.2. 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"

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

1.1.4. Relevant Environmental Laws in India: Table No-1:

1927	The Indian Forest Act
1972	The Wildlife Protection Act
1974	The Water (Prevention and Control of Pollution) Act
1977	The Water (Prevention & Control of Pollution) Cess Act
1980	The Forest (Conservation) Act
1981	The Air (Prevention and Control of Pollution) Act
1986	The Environment Protection Act
1991	The Public Liability Insurance Act
2002	The Biological Diversity Act
2010	The National Green Tribunal Act

1.1.5. Some Important Environmental Rules in India: Table No-2:

1989	Hazardous Waste (Management and Handling) Rules
1989	Manufacture, Storage and Import of Hazardous Chemical Rules
2000	Municipal Solid Waste (Management and Handling) Rules
1998	The Biomedical Waste (Management and Handling) Rules
1999	The Environment (Siting for Industrial Projects) Rules
2000	Noise Pollution (Regulation and Control) Rules
2000	Ozone Depleting Substances (Regulation and Control) Rules
2011	E-waste (Management and Handling) Rules

2011	National Green Tribunal (Practices and Procedure) Rules
2011	Plastic Waste (Management and Handling) Rules

1.1.6 National Environmental Plans & Policy Documents: Table No-3:

1.	National Forest Policy, 1988
2.	National Water Policy, 2002
3.	National Environment Policy or NEP (2006)
4.	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5.	Policy Statement for Abatement of Pollution (1992)
6.	National Action Plan on Climate Change
7.	Vision Statement on Environment and Human Health
8.	Technology Vision 2030 (The Energy Research Institute)
9.	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency)
10.	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

1.2 Objectives:

1. To study present usage of Natural resources the College is consuming
2. To Study CO₂ Emission
3. To study CO₂ Emission Mitigation
4. To study Waste Management practices
5. To study Rain Water Harvesting

1.3 Table No 4: General Details of College:

No	Head	Particulars
1	Name	PES's Modern Law College
2	Address	Pashan Road, Ganeshkhind, Pune
3	Year of Establishment	2003
4	Affiliation	Savitribai Phule Pune University

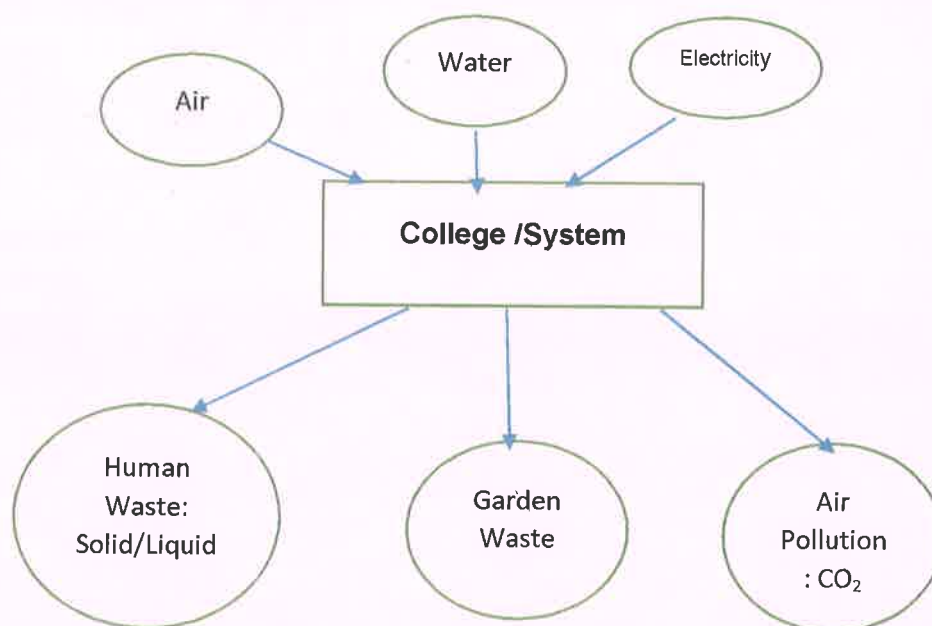
CHAPTER-II

STUDY OF PRESENT ENERGY CONSUMPTION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy
4. Liquefied Petroleum Gas

We try to draw a schematic diagram for the College System & Environment as under.



Now we compute the Generation of CO₂ on account of consumption of Electrical Energy & LPG as under.

Table No 5: Electrical Energy Consumption: 2019-20:

No	Month	Energy Consumed, kWh
1	Jul-19	1800
2	Aug-19	1850
3	Sep-19	1900
4	Oct-19	1750
5	Nov-19	1721
6	Dec-19	1835
7	Jan-20	1901
8	Feb-20	1824
9	Mar-20	1785

10	Apr-20	2112
11	May-20	1850
12	Jun-20	1739
13	Total	22067
14	Maximum	2112
15	Minimum	1721
16	Average	1838.9

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



Key observations:

Table No 6: Important parameters:

No	Parameter	Energy consumed, kWh
1	Total	22067
2	Maximum	2112
3	Minimum	1721
4	Average	1838.9

CHAPTER-III

STUDY OF CO₂ EMISSIONS

3.1 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 College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets.

3.2 Basis for computation of CO₂ Emissions:

The basis of Calculation for CO₂ emissions due to Electrical Energy are: 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO₂** into atmosphere

Based on the above Data we compute the CO₂ emissions which are being released in to the atmosphere by the College due to its Day to Day operations

3.3 Table No 7: Month wise CO₂ Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jul-19	1800	1.44
2	Aug-19	1850	1.48
3	Sep-19	1900	1.52
4	Oct-19	1750	1.40
5	Nov-19	1721	1.38
6	Dec-19	1835	1.47
7	Jan-20	1901	1.52
8	Feb-20	1824	1.46
9	Mar-20	1785	1.43
10	Apr-20	2112	1.69
11	May-20	1850	1.48
12	Jun-20	1739	1.39
13	Total	22067	17.65
14	Maximum	2112	1.69
15	Minimum	1721	1.38
16	Average	1838.9	1.47

Chart No 2: Representation of Month wise CO₂ emissions:

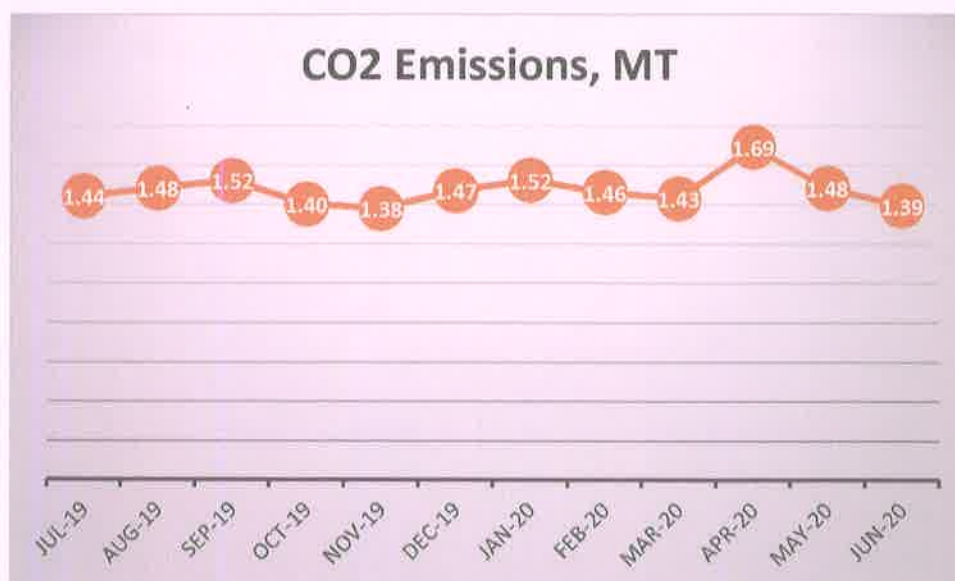


Table No 8: Key observations:

No	Parameter	Energy consumed, kWh	CO2 emissions, MT
1	Total	22067	17.65
2	Maximum	2112	1.69
3	Minimum	1721	1.38
4	Average	1838.9	1.47

CHAPTER-IV

STUDY OF CO₂ MITIGATION

The College has installed **5 kWp** Roof Top Solar PV Plant.
In the following Table, we compute the reduction in CO₂ emission due to Solar PV Plant.

Table No 9: Computation of Reduction in CO₂ Emissions:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Capacity	5	kWp
2	Average Daily Energy generated per kWp	4	kWh/kWp
3	Annual Energy Generation Days	300	Nos
4	Annual Energy Generated by Solar PV Plant	6000	kWh
5	1 kWh of Electrical Energy is equivalent to	0.8	Kg of CO ₂
6	Reduction in Annual CO ₂ Emission = $(0.8) * (4) / 1000$	4.8	MT

Photograph of Roof Top Solar PV Plant:



CHAPTER V

STUDY OF WASTE MANAGEMENT

5.1 Solid Waste Management:

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

Photograph of Bio Composting Storage Tanks:



5.2 E-Waste Management:

The internal communication is through emails and hence there is hardly any generation of E-Waste in the premises.

CHAPTER-VI

STUDY OF RAIN WATER HARVESTING

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

Photograph of Rain Water Harvesting Pipe:



Enrich Consultants

Yashashree, 26, Nirmal Bag Society,

Near Mukhtangan English School, Parvati, Pune 411 009

Tel: 020-24220747 Mobile: 09890444795, Email: enrichcons@gmail.com

INVOICE

To The Principal, Modern Law College, Ganeshkhind, Pune	Invoice No: 2019-20/15 Date: 23/7/2019
--	---

Work Order No	
PAN No	ABBPM0306P
GST Registration No	27ABBPM0306P1ZO
HSN Code	998331

No	Particulars	Charges per Unit, Rs.	Quantity Nos.	Amount in Rs.
1	Consultancy Service Charges for Energy Audit of your Institute campus as per NAAC Guidelines	5000	01	5000.00
2			CGST @ 9 %	450.00
3			SGST @ 9 %	450.00
4			Total Invoice Value	5900.00
5	Amount in Words: Rupees Five Thousand Nine Hundred only.			

For Enrich Consultants,



Authorized Signatory



Enrich Consultants: Bank Details:

Name of Bank	Indian Overseas Bank
Branch	Sahakar nagar, Pune
Name of Account	Enrich Consultants
Current Account Number	199002000015121
IFSC Code	IOBA0001990

**Report
on
Energy & Green Audit
of
Modern Law College,
Pashan Road, Ganeshkhind, Pune**



Year: 2018

Prepared by

Enrich Consultants,
Yashashree, 26, Nirmal Bag Society
Near Mukhtangan English School, Parvati, Pune 411009
Phone: 020-24220747, Cell: 09890444795
Email: enrichcons@gmail.com



MAHARASHTRA ENERGY DEVELOPMENT AGENCY



Maharashtra Energy Development Agency

(A Government of Maharashtra undertaking)

2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006,

Ph No: 020-26614393/266144403

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

ECN/2018-19/CR-05/4174

19th September, 2018

**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 : **Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Muktangan English School,
Parvati, Pune - 411009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme*

Registration Number : **MEDA/ECN/CR-05/2018-19/EA-03**

- 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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **31st March 2021** 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.


(Smith Kudarikar)
General Manager (EC)

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ACKNOWLEDGEMENT

We at Enrich Consultants, Pune, express our sincere gratitude to the management of Progressive Education Society's Modern Law College, for awarding us the assignment of Energy & Green Audit of their Ganeshkhind campus

We are thankful to:

- Dr Sunita Adhav, Principal
- Prof Pawan Kalwala, Assistant Professor

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

EXECUTIVE SUMMARY

1. Modern Law College, Ganeshkhind, Pune consumes Energy in the form of **Electrical Energy** used for various gadgets, Office & other facilities.

2. Present Level of Energy Consumption: Year: 2018:

No	Parameter	Energy consumed, kWh	CO ₂ emissions, MT
1	Maximum	3100	2.48
2	Minimum	2570	2.06
3	Average	2862.9	2.29
4	Total	34355	27.48

3. Various Majors Adopted for Energy Conservation:

The various projects already implemented by the Institute are

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated ACs
- Installation of 15 kWp Roof top Solar PV Plant

4. Percentage of Lighting Power Requirements met by LED bulbs:

The Institute has various types of fittings, namely 40W FTL and LEDs. The percentage of usage of LED to the total annual lighting power requirement works out to be **48.72 %**

5. Waste Management:

5.1 Solid Waste Management:

The waste generated is segregated at source and the bio degradable waste is composted in a Bio composting pit further used as fertilizer for own garden.

5.2 e-Waste Management:

All the internal communication is through emails and hardly any e-Waste is generated in the Day to Day operation of the Institute. The Institute authorities have already contacted Authorized e-Waste management vendor to dispose off any wastage generated during the day-to-day operations.

6. Rain Water Harvesting:

The Institute has already installed **Rainwater Harvesting System** to collect the Rain Water collected at the Terrace which is used for enriching the ground water level.

7. Notes & Assumptions:

1. 1 Unit of Electrical Energy releases **0.8 Kg of CO₂** into atmosphere
2. **1 kWp** Solar PV system generates **4 Units (kWh)** of Electrical Energy per Day
3. Daily working hours-**8** Nos
4. Annual working Days-**280** Nos

ABBREVIATIONS

AC	: Air conditioner
CFL	: Compact Fluorescent Lamp
FTL	: Fluorescent Tube Light
LED	: Light Emitting Diode
kWh	: kilo-Watt Hour
Qty	: Quantity
W	: Watt
kW	: Kilo Watt
PF	: Power Factor
M D	: Maximum Demand
PC	: Personal Computer
MT	: Metric Ton

CHAPTER-I

INTRODUCTION

1.1 Objectives:

1. To study present level of Energy Consumption
2. To Study the present CO₂ emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study Scope for usage of Renewable Energy
5. To study various measures to reduce the Energy Consumption

1.2 Audit Methodology:

1. Study of connected load
2. Study of Electrical Energy Consumption pattern
3. Study usage of Renewable Energy Usage
4. Study of Lighting Load and Usage of LED Lights
5. Study of Rain water harvesting, Waste management
6. To prepare the Report with various Energy conservation measures

1.3 Table No-1: General Details of Institute:

No	Head	Particulars
1	Name	PES's Modern Law College
2	Address	Pashan Road, Ganeshkhind, Pune

CHAPTER-II

STUDY OF CONNECTED LOAD

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

2.1 Table No-2: Details of Overall Connected Load:

No	Location	40 W FTL	22W LED	20W LED	12W LED	FAN	AC	PC
	Ground Floor							
1	Entrance		3	1				
2	Office	1	4			4	1	5
3	Passage			2		1		
4	Staff Room			2		2	1	6
5	Sick Room			1		1		
6	Exam Control Room		2			1		1
7	LLM Department				4	1		1
8	Outside LLM Dept			1		1		
9	Pantry	1						
10	IQAC Conference Hall			4	6	1	1	
11	Principal Room		1		6	1	1	1
12	Ladies Toilet			3				
12	Gents Toilet			1				
13	Vice Principal Cabin			1		1		
14	Outside Library		2	5				
15	Reading Hall		29			8		
16	Toilet			1				
17	Parking			4				
18	Passage			1				
19	Legal Research Center		8			2		9
20	Books Room		20			4		
21	L-1	5				2		
22	L-2	3				3		
23	L-3	6				2		
24	Store Room			1				

25	NSS Room		4			2		
26	Gym	4				3		
27	Legal Aid Center		6					
	First Floor							
No	Location							
1	Staircase			1				
2	Placement Cell					1		
3	Passage			2				
4	L-4			8		4		
5	L-5			7		5		
6	Moot Court Hall	8	1		2	6	3	
7	Passage			3				
8	Ladies Toilet		6			1		
9	Gents Toilet		4	1		1		
10	L-6			5		5		
11	L-7			6		5		
	Second Floor							
No	Location							
1	Passage	7		1				
2	L-8	4		1		3		
3	L-9	5				3		
4	L-10	5				6		
5	Ladies Toilet	3		1		3		
6	Gents Toilet	2						
	Third Floor							
No	Location							
1	Passage	2						
2	L-11	6				3		
3	L-12	6				3		
4	L-13	6				3		
5	Ladies Toilet	2						

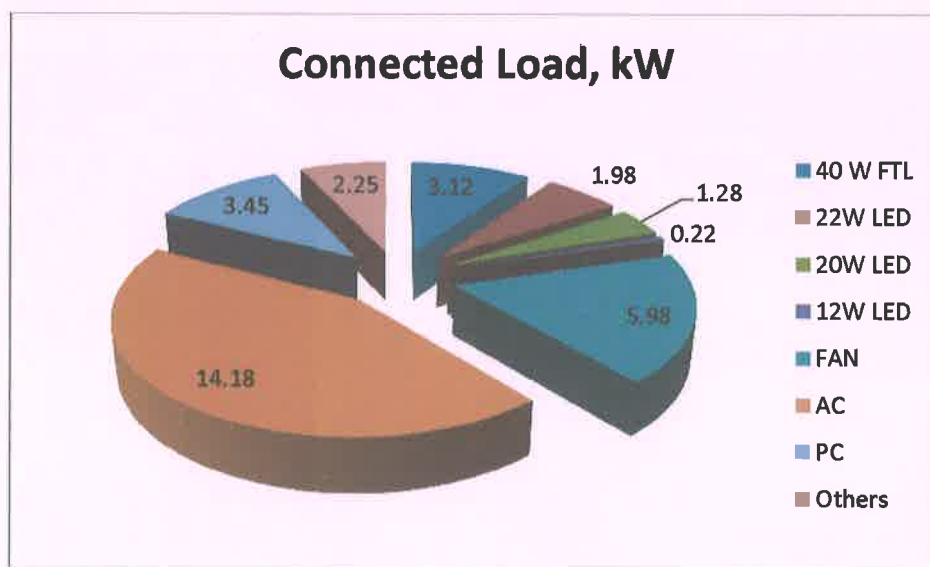
6	Gents Toilet	2						
	Total	78	90	64	18	92	7	23

Now we present the connected load- Equipment wise in the following Table.

Table No-3: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL	78	40	3.12
2	22W LED	90	22	1.98
3	20W LED	64	20	1.28
4	12W LED	18	12	0.22
5	FAN	92	65	5.98
6	AC	7	2025	14.18
7	PC	23	150	3.45
8	Others	15	150	2.25
9	Total			32.45

Chart No-1: Details of Connected Load:



Note: From the above Table, we observe that out of Total Connected Load of **32.45 kW**, the load due to ACs is **14.18 kW** & of Lighting is about **6.6 kW**.

CHAPTER-III

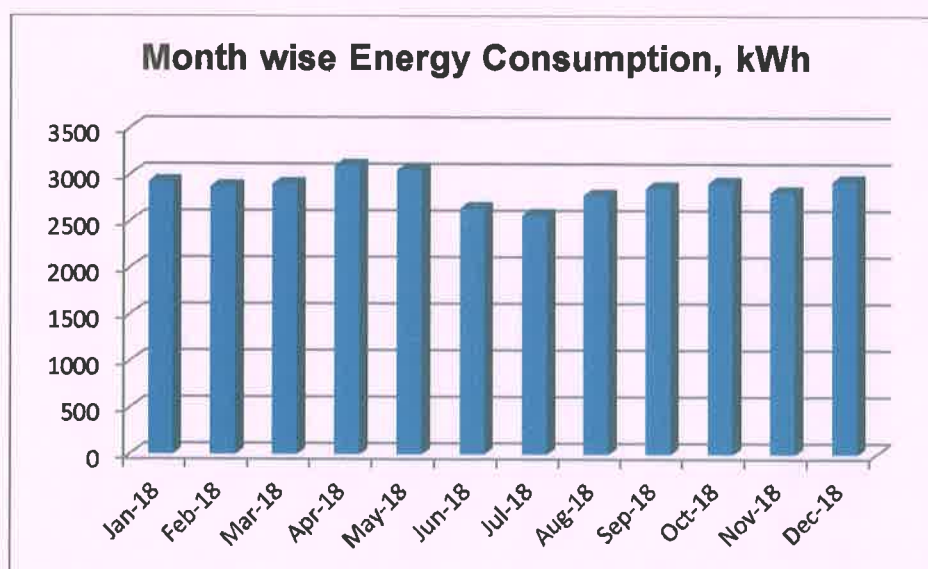
STUDY OF ELECTRICAL ENERGY CONSUMPTION

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

Table No 4: Electrical Energy Consumption Analysis- 2018:

No	Month	Energy, kWh	CO2 Emissions, MT
1	Jan-18	2925	2.34
2	Feb-18	2875	2.30
3	Mar-18	2900	2.32
4	Apr-18	3100	2.48
5	May-18	3050	2.44
6	Jun-18	2640	2.11
7	Jul-18	2570	2.06
8	Aug-18	2780	2.22
9	Sep-18	2860	2.29
10	Oct-18	2910	2.33
11	Nov-18	2815	2.25
12	Dec-18	2930	2.34
13	Maximum	3100	2.48
14	Minimum	2570	2.06
15	Average	2862.9	2.29
16	Total	34355	27.48

3.1.1 Chart No-2: To study the variation of Month wise Energy Consumption, kWh:



Key observations:

Table No 5: Important parameters:

No	Parameter	Energy consumed, kWh
1	Maximum	3100
2	Minimum	2570
3	Average	2862.9
4	Total	34355

CHAPTER-IV

CARBON FOOTPRINTING

4.1 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.

4.2 Basis for computation of CO₂ Emissions:

The basis of Calculation for CO₂ emissions due to Electrical Energy are: 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO₂** into atmosphere

Based on the above Data we compute the CO₂ emissions which are being released in to the atmosphere by the Institute due to its Day to Day operations

4.3 Table No 6: Month wise CO₂ Emissions:

No	Month	Energy, kWh	CO2 Emissions, MT
1	Jan-18	2925	2.34
2	Feb-18	2875	2.30
3	Mar-18	2900	2.32
4	Apr-18	3100	2.48
5	May-18	3050	2.44
6	Jun-18	2640	2.11
7	Jul-18	2570	2.06
8	Aug-18	2780	2.22
9	Sep-18	2860	2.29
10	Oct-18	2910	2.33
11	Nov-18	2815	2.25
12	Dec-18	2930	2.34
13	Maximum	3100	2.48
14	Minimum	2570	2.06
15	Average	2862.9	2.29
16	Total	34355	27.48

4.4 Chart No-3: Representation of Month wise CO₂ emissions:

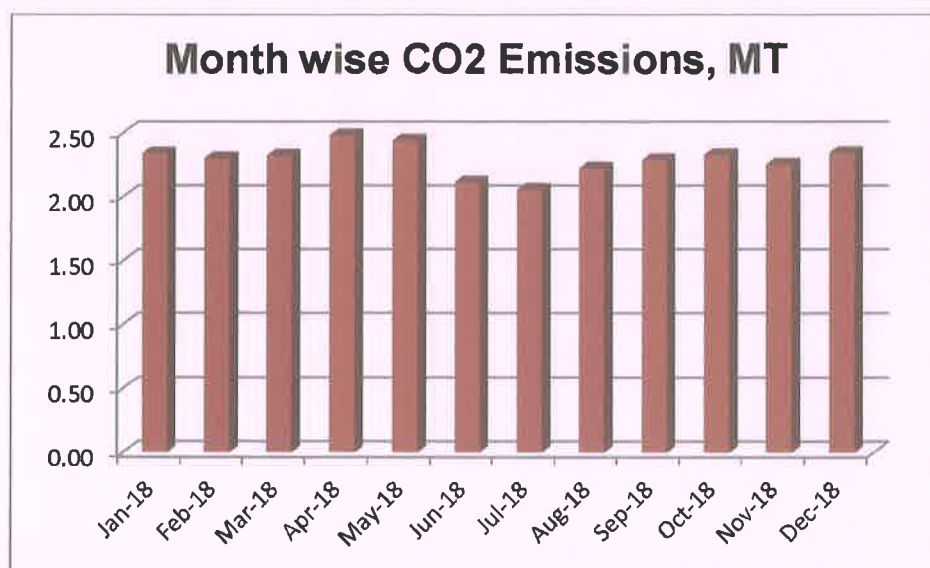


Table No 7: Key observations:

No	Value	CO2 emissions, MT
1	Maximum	2.48
2	Minimum	2.06
3	Average	2.29
4	Total	27.48

CHAPTER-V

STUDY OF USAGE OF LED LIGHTS

5.1 The Institute has about 78 Nos 40 W FTL fittings & LED fittings. In the following Table, we present the percentage of usage of LED lights to the annual Lighting power requirement.

Table No-9: Study of Lighting Load:

No	Particulars	Value	Unit
1	Qty of 40 W FTL	78	Nos
2	Load/Unit of 40 W FTL	40	W/Unit
3	Total Load of 40 W FTL fittings	3.12	kW
4	Qty of 12 W LED fitting	18	Nos
5	Load/Unit of 12 W LED fitting	12	W/Unit
6	Total Load of 12 W LED fittings	0.216	kW
7	Qty of 20 W LED fitting	64	Nos
8	Load/Unit of 20 W LED fitting	12	W/Unit
9	Total Load of 20 W LED fittings	0.768	kW
10	Qty of 22 W LED fitting	90	Nos
11	Load/Unit of 22 W LED fitting	22	W/Unit
12	Total Load of 22 W LED fittings	1.98	kW
13	Total Lighting Load=3+6+9+12	6.084	kW
14	Total LED Lighting Load=6+9+12	2.964	kW
15	Daily Operating period	5	Hrs
16	Annual Operating Days	280	Nos
17	Annual Total Lighting power required	8517.6	kWh/Annum
18	Annual LED Power required	4149.6	kWh/Annum
19	% of LED lighting to Total Annual Lighting Requirement	48.72	%

CHAPTER VI

STUDY OF WASTE MANAGEMENT

In this Chapter, we study the Waste management systems of the Institute.

7.1 Solid Waste Management:

The waste generated is segregated at the source itself. The bio-degradable waste is collected in a bio composting pit and it is then used as fertilizer for own garden.

7.2 e-Waste Management:

The internal communication of the Institute is through Internet within the staff members. There are hardly any floppies or CDs used for day to day operations. Hence as far as the e-waste is concerned hardly any waste is generated during the day to day operations. In addition to this the Institute authorities have already finalized Authorized e-Waste management agency to dispose of the old equipment.

CHAPTER-VII

STUDY OF RAIN WATER HARVESTING

The Institute has already implemented the Rain Water Harvesting Project. The Institute has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and bore well is recharged through this Rain water.

CHAPTER-VIII

STUDY OF GREEN PRACTICES

8.1 Mode of transportation for coming to College:

8.2 No of students who don't use own Vehicle for coming to College:

During the Study it was revealed that there are about — no of students in the College. Out of these — no of students are staying in the Hostel block, while — no of students are staying in the nearby areas.

Out of — no of students, — no of students come to College with their own 2-Wheeler.

Thus the % of students coming to College, without using own Automobile is --%.

8.3 Usage of Public Transport:

During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Pune Municipal Transport local buses, local sharing type auto rickshaws. The average number of students is approximately

Thus the % of students using Public transport is about ---%

8.4 Pedestrian Friendly Roads:

The College has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

8.5 Various measures adopted for this purpose:

- Installation of Separate waste bins for Dry waste & wet waste
- Usage of paper tea cups in the College canteen
- Display of boards in the campus for Plastic Free campus
- Distribution of -- no of dust bins in various areas in and around the College

8.6 Paperless Office:

The internal communication of the College is through the Internet. There are hardly any day to day operations, where printing is required.

8.7 Green Landscaping with Trees and Plants:

The College has beautiful maintained Garden.

Report
on
ENERGY & GREEN AUDIT
of
MODERN LAW COLLEGE,
Ganeshkhind, University Circle, Pune 411 016

Year: 2016

Prepared by:

Enrich Consultants

Yashashree, 26, Nirmal Bag Society,
Near Mukhtangan English School, Parvati, Pune 411009
Phone: 020 24220747 Email: enrichcons@gmail.com



MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001 : 2000 Reg. no. : RQ 91 / 2482



Maharashtra Energy Development Agency

(A Government of Maharashtra Institution)

2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006

Ph No: 020-26614393/266144403, Fax No: 020-26615031

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

ECN/2014-15/CR-10/6038

14 November, 2014

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 under Save Energy Programme of MEDA.

Name and Address of the firm : Enrich Consultants
Yashashree, Plot No. 26,
Nirmal Baug Society, Parvati,
Pune - 411009.

Registration Category : *Empanelled Consultant for Save Energy Programme.*

Registration Number : **MEDA/ECN/CR-10/2014-15/ EA-37**

- The Save Energy 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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
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(Hemant H. Patil)
Manager (EC)

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ACKNOWLEDGEMENT

We at Enrich Consultants, Pune, express our sincere gratitude to the management of Modern Law College, Pune for awarding us the assignment of Energy & Green Audit of their Ganeshkhind Campus

We are thankful to:

- Dr Sunita Adhav , Principal
- Mr. Pawan Kelawala, Assistant Professor
- Mr. Vikrant Yadav, I/C- Students Welfare

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.



EXECUTIVE SUMMARY

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO₂ emissions

1. MODERN LAW COLLEGE consumes Energy in the form of **ELECTRICAL ENERGY** used for various gadgets in Office, class rooms & at other facilities.

2. ENERGY CONSERVATION:

The various projects already implemented by the College are

1. Installation of Capacitor Bank at LT Mains
2. Replacement of Old tube light fittings with Energy Efficient LED fittings
3. Usage of Electronic chokes for new Tube light fittings
4. Installation of Solar PV plant on the roof top

3. e-WASTE MANAGEMENT:

It is observed that the internal communication is through emails, hence hardly any e-Waste is generated in day to day operations.

4. RAIN WATER HARVESTING:

It is recommended to install Rain water harvesting plant in order to use the Rain Water, for domestic purpose.

5. IMPORTANT PARAMETERS: ELECTRICAL ENERGY:

No	Parameter	Max	Min	Average
1	Units consumed, kWh	18912	11516	15982
2	Max Demand, kVA	79	46	67
3	Power Factor	0.962	0.896	0.94

6. MAJOR ACHIEVEMENTS:

1. Reduction in Average monthly units consumed by **808 kWh** or by **5 %**
2. Increase in Average Power Factor by value of **0.062** or by **7 %**
3. Reduction in CO₂ emissions **from 13.36 MT to 12.71 MT/Month**
4. Reduction in CO₂ benchmark **from 0.55 Kg/sq ft to 0.52 Kg/sq ft**



7. IMPORTANT BENCHMARKS: kWh CO₂ EMISSIONS PER SQ. FT.

No	Particulars	Value	Unit
1	Electrical Energy Consumption	0.66	kWh/sq ft

Notes & assumptions:

1. **1 kWh (Unit) of Electrical Energy releases 0.8 Kg of CO₂ into atmosphere**
2. **Daily working hours-10**
3. **Annual working Days-300**
4. **Average Rate of Electrical Energy- Rs 10/- per kWh**



ABBREVIATIONS

DP	: Double Pole
CFL	: Compact Fluorescent Lamp
EESL	Energy Efficiency Services Limited
F P	- Feeder Pillar
MSEDCL	: Maharashtra State Electricity Distribution Company Ltd.
MEDA	- Maharashtra Energy Development Agency
MIDC	- Maharashtra Industrial Development Corporation
V	: Voltage
I	: Current
kW	: kilo-Watt
kVA	: Active Power
kVAr	: Reactive Power
P F	: Power Factor
Kms.	: Kilometers



CHAPTER-I

INTRODUCTION

1.1 Objectives:

1. To study present level of Energy Consumption
2. To Study the present CO2 emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

1.2 Audit Methodology:

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

1.3 Energy Audit Instruments:

1. Portable Power Analyzer
2. Lux meter
3. Anemometer
4. Digital Temperature Indicator

1.4 General Details of College:

No	Head	Particulars
1	Name of Institution	Modern Law College
2	Address	Ganeshkhind, Pune 411 007
3	Year of Establishment	2007
4	Salient Features	Permanent affiliation to University of Pun
5	Courses offered	5 Year's BA LLB, LLB, LLM & Diploma Courses
6	Floor area	24000 sq ft

CHAPTER-II

STUDY OF CONNECTED LOAD

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

2.1.1 Details of Electrical loads at Main Building:

Section	PCs	Tubelight (Mag. Choke)	Tubelight (Elec. Choke)	CFL	LED	Fan	AC	Focus lamp
GROUND FLOOR:								
1. Office	15	4	6		1	6	1	
2. Corridor		5	1	4	1			
3. Principal Office	2			1	6		1	
4. Free Legal Aid Group	1			4		1		
5. Conference Hall				11		1 (wall)	1	
6. Vice Principal Office	1	1				1		
7. HOD	1	4				2		
8. Library	3	9	25			10		
Sub Total	23	23	32	20	8	20	3	0
FIRST FLOOR:								
1. Corridor		7						
2. L-7		5	2			4		
3. L-6		5				5		
4. Toilet					2	1		
5. L-5		5	2			5		
6. Moot Court Mall		16				6	3	2
7. L-4		7	1			5		
8. Exam Hall		45	5	0	2	26	3	2
Sub Total								
SECOND FLOOR:								
1. Corridor		8						
2. Hall				28		6		3
3. Toilet		1	2			1		



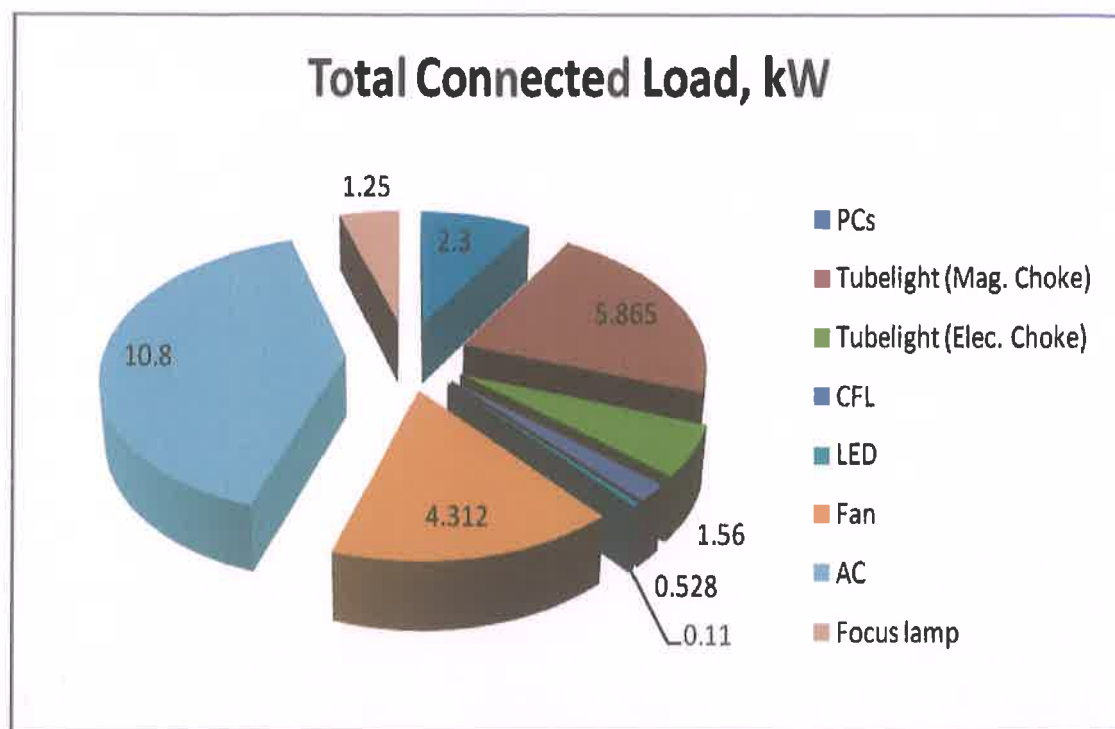
4. L-10		6				6		
5. L-9		5				3		
6. L-8		5				3		
Sub Total		25	2	28	0	19	0	3
THIRD FLOOR:								
1. Corridor		2						
2. Toilet (G+L)		4						
3. L-13		5				4		
4. L-12		5				4		
5. L-11		6				4		
Sub Total		22	0	0	0	12	0	0

2.2 Details of Total Connected Load:

No	Equipment	Quantity	Load/Unit, W	Total , Load, kW	% of Total Load
1	PCs	23	100	2.3	8.61
2	Tubelight (Mag. Choke)	115	51	5.86	21.95
3	Tubelight (Elec. Choke)	39	40	1.56	5.84
4	CFL	48	11	0.52	1.98
5	LED	10	11	0.11	0.41
6	Fan	77	56	4.31	16.13
7	A C	6	1800	10.8	40.41
8	Focus lamp	5	250	1.25	4.68
9	Total			26.73	100.00



We present the same in a PIE Chart as under



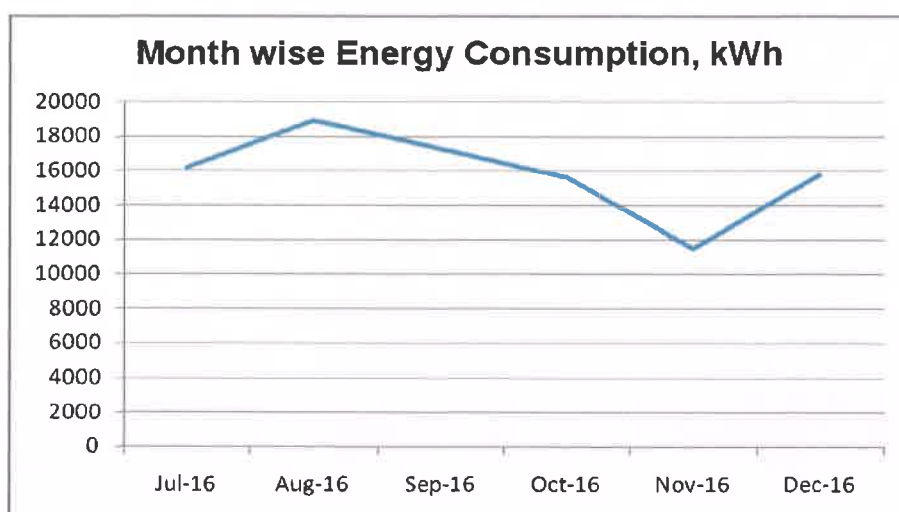
CHAPTER-III

HISTORICAL DATA ANALYSIS: ELECTRICAL ENERGY

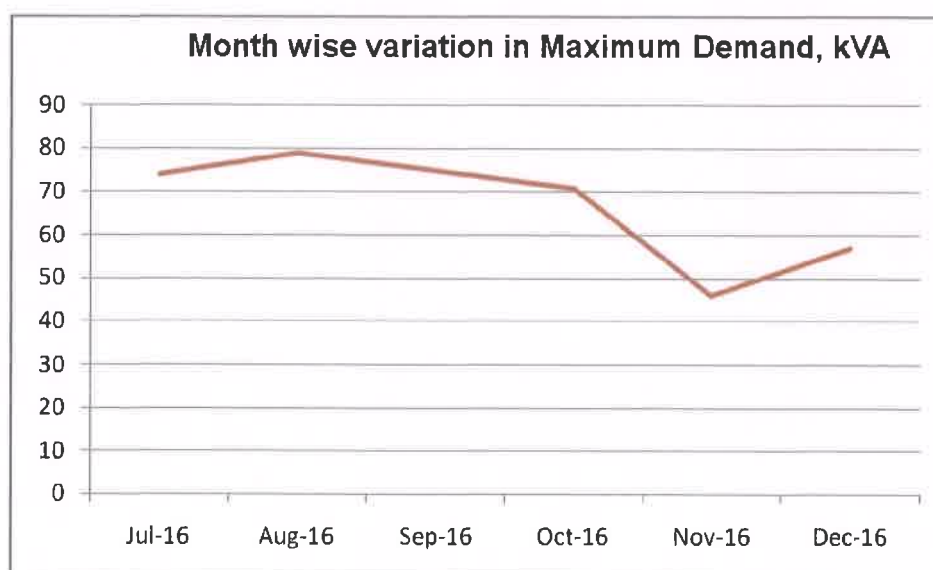
In this chapter, we present the analysis of last year Electricity Bills

Table No. 2: Electrical Bill Analysis- 2016:

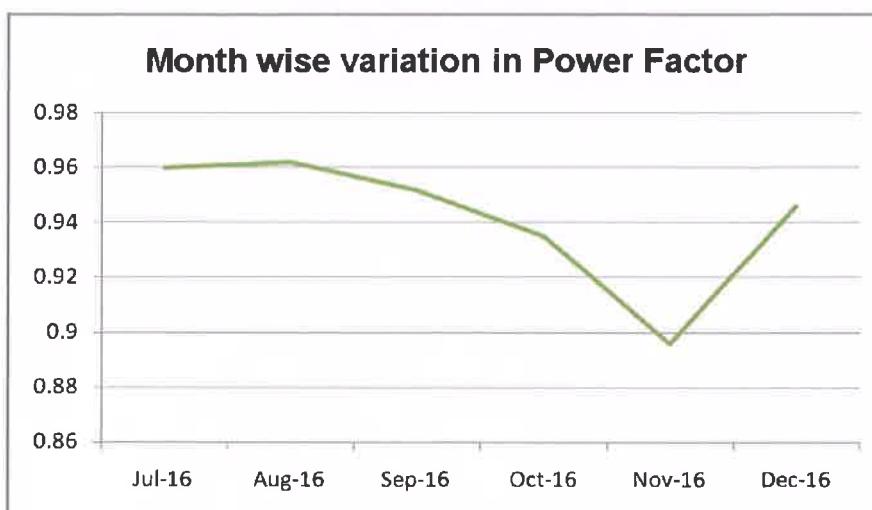
3.1 To study the variation of Monthly Units' Consumption:



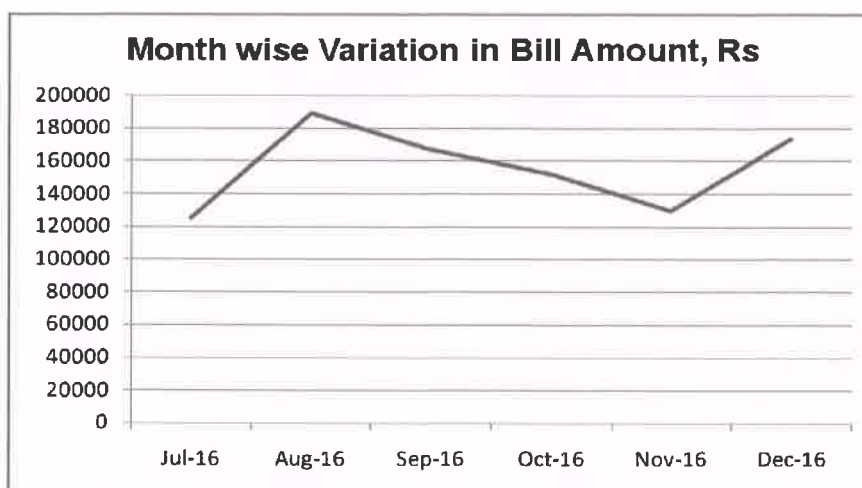
3.2 To study the variation of Monthly Demand, kVA:



3.3 To study the variation of Monthly Power Factor:



3.4 To study the variation of Monthly Electricity Bill:



3.5 Key Inference drawn:

From the above analysis, we present following important parameters:

Table No: Variation in Important Parameters:

No	Parameter	Max	Min	Average
1	Units consumed, kWh	18912	11516	15982
2	Max Demand, kVA	79	46	67
3	Power Factor	0.962	0.896	0.94

3.6 Benchmarking: kWh/ sq. ft.:

Now we compute the Average units consumed per sq ft. The total College area is 24000 sq. ft.
The average Units consumed per sq ft is = $(15892) / (24000) = 0.66 \text{ kWh/sq ft}$

CHAPTER-IV

CARBON FOOTPRINTING

4.1 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 College for performing its day to day activities

The College uses two forms of Energy namely: Electrical Energy for various Electrical gadgets

4.2 Basis for computation of CO₂ Emissions:

The basis of Calculation for CO₂ emissions due to LPG & Electrical Energy are as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO₂** into atmosphere

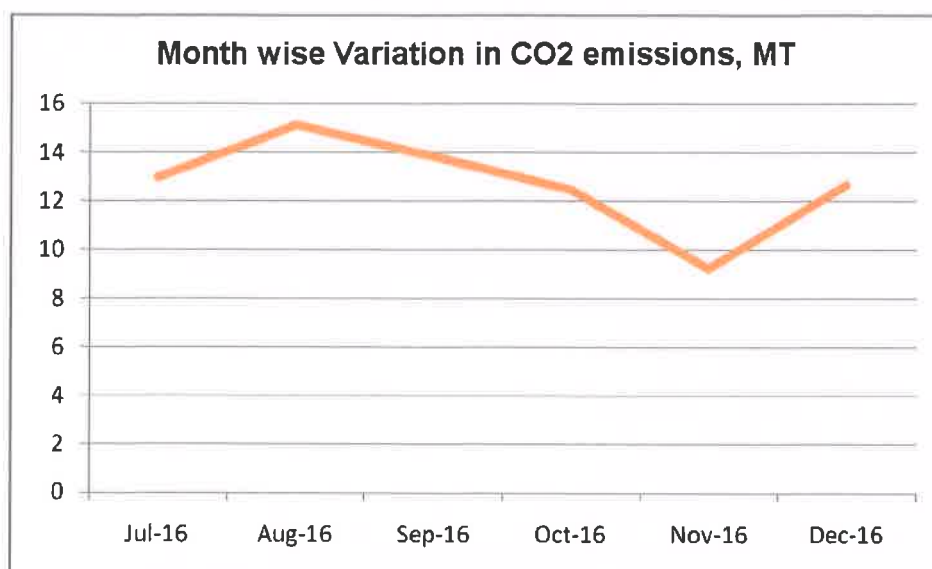
Based on the above Data we compute the CO₂ emissions which are being released in to the atmosphere by the College due to its Day to Day operations.

We herewith furnish the details of various forms of Energy consumption as under

4.3 Table: Month wise Consumption of Electrical Energy:

No	Month	kWh	CO2 emissions, MT
1	Jul-16	16214	12.97
2	Aug-16	18912	15.13
3	Sep-16	17316	13.85
4	Oct-16	15576	12.46
5	Nov-16	11516	9.21
6	Dec-16	15820	12.66
7	Max	18912	15.13
8	Min	11516	9.21
9	Average	15892	12.71

4.4 Representation of Month wise CO₂ emissions:



We now represent the CO₂ emissions, in a PIE Chart, on the basis if Energy Form as under

4.5 Key Inference Drawn:

From the above Table, we find that the Average monthly CO₂ emissions are **12.71 MT**.

4.6 CO₂ Benchmarking:

We now compute the CO₂ emissions per square feet. The College area is 24000 sq. ft.

Hence the CO₂ emissions per sq ft are: $(12.71 \times 1000) / (24000) = 0.53 \text{ Kg/sq ft}$

CHAPTER-V

PHOTOGRAPHS OF PROJECTS IMPLEMENTED

5.1 Installation of LED Light fittings:



5.2 Installation of LED Light fittings for outdoor light applications- With Solar PV module:



5.3 Display of Sign boards for creating Energy Conservation awareness:

