ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

AUDIT CONDUCTED FOR

SS INSTITUTE OF PHARMACY

NH-544, Salem – Coimbatore Highways
Manjakalpatti, Kuppanur Post, Sankari (Tk), Salem (Dt), Tamil Nadu – 637 301.

DATE OF AUDIT

27 MAY 2024

(Audited and Accounted from June 2023 to May 2024)

AUDIT CONDUCTED BY

RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING

(An ISO 9001:2025 Certified Company & Registered Under MSME, GoI)

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

1. ACKNOWLEDGEMENT

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ACKNOWLEDGEMENT

RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING, Coimbatore – 641 062 is thankful to the Management, Principal, Faculty and Technical team members of **M//s. SS INSTITUTE OF PHARMACY,** NH-544, Salem – Coimbatore Highways, Manjakalpatti, Kuppanur Post, Sankari (Tk), Salem (Dt), Tamil Nadu – 637 301, India for providing an opportunity to conduct a **detailed Energy, Environment and Green Audit** process in the college premises.

It is our great pleasure which must be recorded here that the Management of **V.S Educational & Charitable Trust** extended all possible support and assistance resulting in thorough completion of the audit process. The audit team appreciates the cooperation and guidance extended during the course of site visit and measurements. We are also thankful to all those who gave us the necessary inputs and information to carry out this very vital exercise.

Finally, we offer our sincere thanks to all the members in the engineering division/ technical / non-technical divisions and office members who were directly and indirectly involved with us during collection of data and while conducting field measurements.

Management Team Members	
Dr. V. SUJATHA, B.E., M.E., Ph.D	CHAIRMAN
Dr. C. JOTHIMANIVANNAN, M. Pharm., Ph.D	PRINCIPAL
Audit Team Member	
Dr. S.R. SIVARASU, Ph.D.,	**BEE Certified Energy Auditor (EA-27299)** Lead Auditor-ISO-14001:2015 (EMS), IGBC AP, GRIHA CP, CII CP in SWM Carbon Footprint Auditor & Implementor **Mobile: +91- 80567 19372, 99420 29372**

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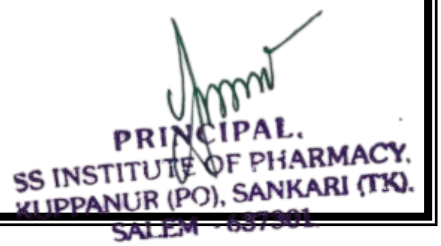
ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

2. INTRODUCTION

TO

ENERGY-ENVIRONMENT-GREEN AUDIT



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2.1: Preface about the Institution:

- **SS Institute of Pharmacy** located in Sankari established in **2018** has a campus spread over a spacious area with imposing building, lush green campus & unpolluted environment with magnificent infrastructure.
- **Eminent professionals** are drawn from top Pharmacy institutions of the country. All faculty members to impart professional education and produce a well competent pharmacist in the society.

2.2: Vision:

→ To establish a premier, globally recognized institute excelling in pharmacy education, to nurture highly competent pharmacy professional to the society.

2.3: Mission:

⊕ Our mission is to empower students from rural regions, transforming them into skilled and responsible citizens who will play a key role in advancing our nation.

⊕ To collaborate with leading pharmacy organization to develop their skills and to train students in pharmaceutical science to meet both national and global demands.

⊕ To lead in pharmaceutical education by combining critical thinking, problem solving, and professional skills.

⊕ To develop and support emerging pharmacy professionals who can excel and lead in the pharmaceutical industry.

2.4: Major Activities in the Institution:

1. • Knowledge Transferring through teaching learning process
2. • Innovative research and development activities
3. • Training programs(Academic & Industry)
4. • Value added and certification courses
5. • Career and Placement opportunities

2.5: Scope of the Audit Process:

- **Energy Audit:** To conduct a detailed energy audit in the college campus with a main focus to identify judicious usage of electrical and thermal energy (where, when, why and how energy is being utilized).
- **Environmental Audit:** Identification of history of activities, present environmental practices followed, monitoring records and known sources of environmental issues inside the college.
- **Green Audit:** Assessment on Campus greenery in terms of mature trees, flowering shrubs, bushes, medicinal plants, adoption of green energy generation and utilization, reduction of CO_2 due to green energy system and identification of possible implementation and enhancement of current greenery practices.

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2.6: Outcomes of the Audit Process:

- Recommendations based on field measurement with achievable **En**ergy **Con**servation (ENCON) proposals under **No cost/Low cost and Cost investment categories**
- **Minimization of present energy cost** by adjusting and optimizing energy usage and reduction of energy wastage without affecting the regular activities
- **Identification of possible cost and energy saving from energy conservation, waste reduction, reuse and recycling**
- Formation of methodology for long term road map for maintaining green environment within the campus and encourage the stakeholders for continuous improvements

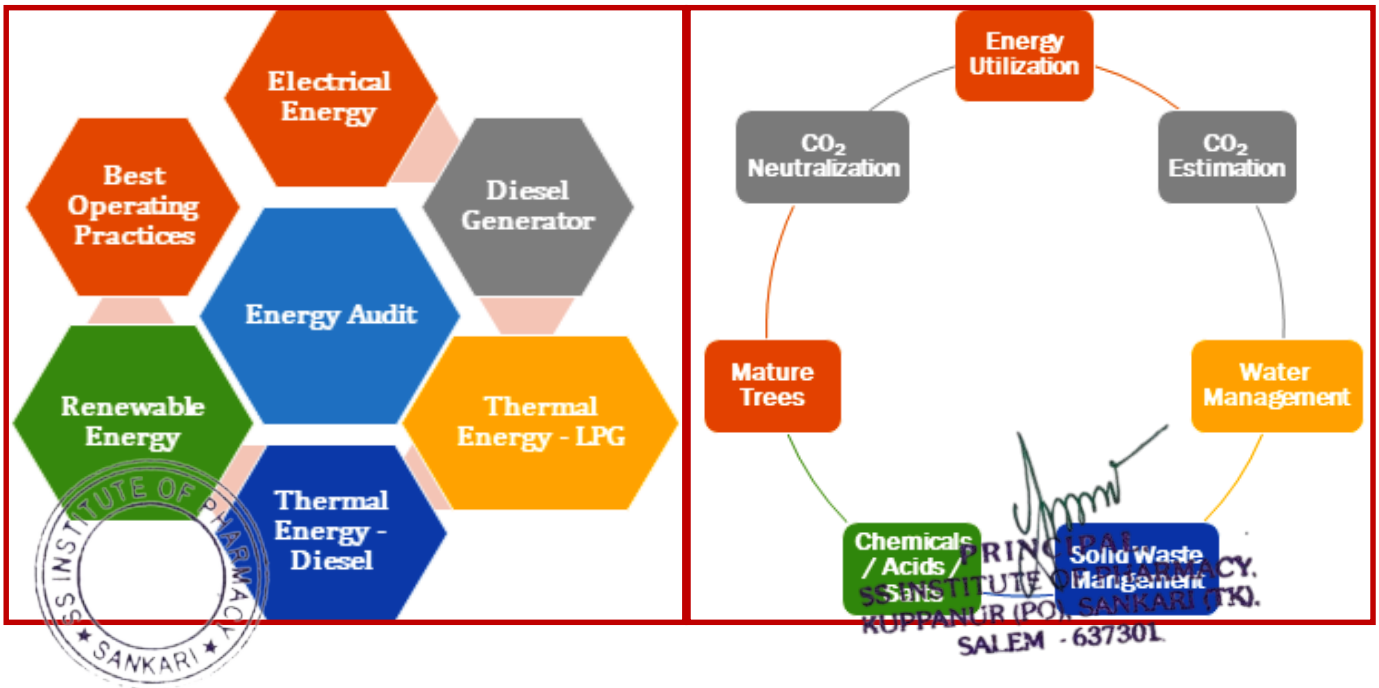
2.7: Audit Approach:

The audit team completed the assessment of energy consumption in the factory premises and operating hours of each machines (system) using two approaches namely **i) Objective Approach** in which a detailed measurement was taken and **ii) Subjective Approach** in which field data is collected from the maintenance department.

2.9: Standards Used:

- Bureau of Energy Efficiency (BEE) Guidelines to conduct the detailed energy audit process
- **ISO 14064-Part-1** – Specification with guidance at the organization level for quantification and reporting of GHG emissions and removals (Second Edition)
- **ISO 14064-Part-2** – Specification with guidance at the project level for quantification, monitoring and reporting of GHG emissions reductions or removal enhancement (Second Edition-2019)
- **ISO 14064-Part-3** – Specification with guidance for the verification and validation of GHG statements (Second Edition-2019)

2.10: Coverage in Energy- Environment & Green Audit Process:



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3. EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

Energy Analysis:

→ A detailed audit was conducted **M/s. SS INSTITUTE OF PHARMACY,** NH-544, Salem - Coimbatore Highways, Manjakalpatti, Kuppanur Post, Sankari (Tk), Salem (Dt), Tamil Nadu – 637 301.

→ The audit team has come out with ***06 Energy Conservation Proposals (ENCONs)*** and the summary of all the ENCONs are given below:

S. No.	Description	Parameters		
		Present	After	Savings
1.	Annual Energy Consumption	73,438 kWh + 1,888 kg LPG + 12.0 Tons Wood	59,519 kWh + 1,699.2 kg LPG + 10.8 Tons Wood	**13,919 kWh + 188.8 kg LPG + 1.2 Tons Wood**
2.	Annual Financial Cost	**Rs. 12.5 Lakhs**	**Rs.10.5 Lakhs**	**Rs. 2.0 Lakhs**
3.	Annual CO_2 Emission	97.1 Tons	82.9 Tons	**14.2** Tons
4.	Initial Investment	Rs. 2.6 Lakhs		
5.	Simple Payback	**Nearly 1.3 Years (15.6 Months)**		
6.	Energy Reduction	**19.0 % Electricity + 10 % LPG + 10 % Wood**		

(Audited and Accounted from June 2023 to May 2024)

Note:

- Apart from the Energy Conservation, the audit team proposes ***many technical recommendations*** focusing on energy, equipment's life improvement, safety and best operating practices.
- All types of energy carriers (like **Electricity & LPG**) used for regular applications are considered for this audit process.

Audit Conducted & Verified by

(Dr. S.R. SIVARASU)

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Table-1: Energy Conservation Proposal (ENCON) along with Annual Energy and Financial Savings

S. No.	Proposed Energy Conservation Measures	% Saving & Source	Estimated Savings		Initial Investment (Rs.)	Payback Period
			Annual Energy Savings	Monetary Savings (Rs.)		
1.	Reduction of Cable Losses and Active Power Consumption using Capacitor Compensation	2 % on Electrical	1,469 kWh	18,363	12,000	0.7 Years
2.	Replacement of Fluorescent Lamps with Energy Efficient Lamps (Considering only **50 Nos of Lamps** in Phase-I Implementation swapping to LED Lamps)	50 % on Lighting	3,000 kWh	36,000	30,000	0.8 Years
3.	Replacement of Existing Convention Ceiling Fans into EC BLDC Fans	50 % on Fans Load	9,450 kWh	1,13,400	1,89,000	1.7 Years
4.	Replacement of conventional cylinders with XtraTEJ LPG cylinders with high flame temperature	5 % of LPG	94.4 kg	9,506	Zero Cost	Immediate
5.	Reduction of LPG Consumption using Burner Cleaning and Swapping of Active Burners.	5 % of LPG for Stoves	94.4 kg	9,506	5,000	0.5 Years
6.	Reduction of Heat Energy Exposed in the Boiler Outer Side + Steam Pipes Lines using TCC	10 % Wood on Boiler	1.2 Tons	14,400	20,000	1.4 Years
Total	**13,919 kWh + 188.8 kg LPG + 1.2 Tons Wood**			**2,01,175**	**2,56,000**	--

Recommendations and Best Operating Practices:

- All SSB must be fitted with digital energy meters are the readings must be taken daily.
- Prepare block wise maintenance checklist of electrical and thermal system
- Calculate the Unit Per Litre (UPL) for every run of DG and average it for monthly
- Adopt a policy and fix a target to convert the existing conventional lightings and fans into energy efficient lights and fans
- Define and apply appropriate power schemes to reduce power consumption when the system is idle
- Earth pits must be visible for easy access, should be done regular maintenance and measure their values annually
- Similar to Fan, now BLDC based ACs are made available in the market; which consumes less amount of energy (Power) during its starting and running condition.
- It is essential and the right time to form an **Energy Management Team**

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART-A: ENERGY AUDIT REPORT

4. STUDY ON ENERGY CONSUMPTION PATTERN

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4.1: Assessment of Existing Electrical and Thermal Energy Systems:

<table>
<tr><th>S. No.</th><th>Description</th><th colspan="4">Details</th></tr>
<tr><td colspan="6">Electrical Energy Usage</td></tr>
<tr><td>1.</td><td>Name of the customer</td><td colspan="4">SS INSTITUTE OF PHARMACY</td></tr>
<tr><td>2.</td><td>Communication Address</td><td colspan="4">NH-544, Salem – Coimbatore Highways, Manjakalpatti, Kuppanur Post, Sankari (Tk), Salem (Dt), Tamil Nadu – 637 301</td></tr>
<tr><td>3.</td><td>Service Number Type of Supply & Tariff</td><td colspan="4">SC No 08-256-007-1663; Low Tension; Tariff-IIB</td></tr>
<tr><td rowspan="3">4.</td><td rowspan="3">Tariff Structure:
↗ Old: Before July 2023
↗ New: From July 2023</td><td>Description</td><td colspan="2">Old</td><td>New *</td></tr>
<tr><td>Unit Charge</td><td colspan="2">Rs.6.35/kWh</td><td>Rs. 8.50/kWh</td></tr>
<tr><td>Fixed Charge</td><td colspan="2">Rs. 140/kW</td><td>Rs. 325/kW</td></tr>
<tr><td>5.</td><td>Energy Suppliers</td><td colspan="4">Tamilnadu Generation & Distribution Corporation (TANGEDCO)</td></tr>
<tr><td>6.</td><td>Generator Details</td><td colspan="4">20 kVA (Inbuilt fuel tank - 65 L)</td></tr>
<tr><td>7.</td><td>DG Operation</td><td colspan="4">20 kVA Manual Operation</td></tr>
<tr><td colspan="6">Annual Electrical Energy Consumption, Electricity Consumption from DG & Diesel Consumption</td></tr>
<tr><td>Electricity</td><td>73,438 kWh</td><td>Diesel for DG</td><td>3,545 Litres</td><td>Units Generated</td><td>463 kWh</td></tr>
<tr><td colspan="6">Thermal Energy Used</td></tr>
<tr><td rowspan="3">8.</td><td colspan="3">Liquified Petroleum Gas (LPG)</td><td colspan="2" rowspan="2">Cooking</td></tr>
<tr><td colspan="3">Seasonal Wood</td></tr>
<tr><td colspan="3">Diesel (Ordinary)</td><td colspan="2">Transport + DG</td></tr>
<tr><td colspan="6">Annual Energy Consumption of Thermal System</td></tr>
<tr><td>LPG</td><td>1,888 kg</td><td>Wood</td><td>12 Tons</td><td>Diesel (Transport)</td><td>3,545.2 Litres</td></tr>
<tr><td colspan="6">General Loads (Both Electrical and Thermal)</td></tr>
<tr><td rowspan="2">9.</td><td rowspan="2">Lighting System</td><td colspan="4">❖ Indoor lighting: The management is now committed to convert the existing FTL into LED in a phased manner</td></tr>
<tr><td colspan="4">❖ Outdoor lighting: All the street lightings are LED based energy efficient lamps
❖ Recommended to retrofit timer based ON-OFF control in the existing street lighting system</td></tr>
<tr><td>10.</td><td>Fan Loads (Ceiling)</td><td colspan="4">❖ All the ceiling fans are conventional type only which consumes nearly 60-70 W/fan at maximum position.
❖ The audit team requested to change the conventional fans into BLDC based Electronically Commutated fans in a</td></tr>
</table>

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		phased manner. The average power consumption will be **35 W/fan** at maximum position (**More than 50 % reduction**)
11.	Air Conditioning System	• Mostly **BEE star rated** ACs and the outdoor units are mostly placed in shaded area of the respective building
12.	Motors and Pump loads	• Mainly used for water distribution, purification and waste water treatment • Small motors are used in hotel kitchen equipment's & in the canteen
13.	Uninterrupted Power System (UPS)	• All the computers, servers, surveillance systems, projectors, telephonic units are connected with UPS with nominal back up time of **15-30 min.** • Total capacity of the UPS is nearly **20 kVA.**

Table-2: Annual Energy Consumption and Energy Generation (2022-23)

S. No.	Month	Electricity Consumption (kWh)	LPG Consumed (kg)	Wood Consumption (Tons)	Diesel Consumed (L)		
					DG	Transport	Total
1.	Jun-23	6,158	164.2	1.4	9	150	159
2.	Jul-23	6,658	218.9	0.5	11	122	133
3.	Aug-23	6,252	218.9	1.0	11	191	202
4.	Sep-23	5,116	127.7	1.0	13	153	166
5.	Oct-23	5,627	200.6	1.2	14	240	254
6.	Nov-23	5,726	164.2	1.0	10	244	254
7.	Dec-23	5,411	164.2	1.2	11	126	137
8.	Jan-24	6,047	136.8	1.0	12	427	439
9.	Feb-24	7,072	136.8	0.7	13	504	517
10.	Mar-24	6,099	109.4	0.7	15	436	451
11.	Apr-24	6,827	109.4	1.0	13	341	354
12.	May-24	6,448	136.8	1.0	14	468	482
Total		73,438	1,887.8	11.5	145	3,401	3,545

- The annual average cost of the electricity is Rs. 12.51/kWh.
- The annual average cost of the LPG is Rs. 100.7 /kg
- The annual average cost of the Wood is Rs. 12,000/Ton

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART-B: ENVIRONMENT AUDIT REPORT

5. ESTIMATION OF CO_2 EMISSION & NEUTRALIZATION

(ELECTRICITY, LPG, DIESEL & MATURE TREES)

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5.1: Assessment of Annual Energy Usage:

Table-3 shows the types of energy carriers used for their regular operation in the college campus along with application area and their source.

Table-3: Energy Carriers, Application area and their sources used for College Operation

S. No.	Type of Energy Carrier	Application Area	Source of Procurement
1.	Electricity (LT Service **1 No**.)	Powering to all electrical / electronic / HVAC equipment's	From TANGEDCO
2.	Diesel	Transport vehicles and Diesel Generator (Captive Generation)	From authorised distributor
3.	Liquified Petroleum Gas (LPG)	Used only for cooking	
4.	Seasonal Wood		From local vendor
5.	Mature Trees, Bushes & shrubs	The college has nearly **300 mature trees** of different varieties which are more than **10 years old.**	

5.2: Environmental System: CO_2 Balance Sheet:

→ CO_2 Balance sheet is the indicator on the carbon emission and their neutralization in a year

→ As per the Environmental Management System (EMS); only Scope-1 & Scope-2 based energy consumption is accounted.

→ The following tables provide the balance sheet indicating various energy carriers associated with the regular activities and their CO_2 mapping.

Table-4: Environmental System: CO_2 Balance Sheet (2023-24)

S. No.	Annual Energy Consumption & CO_2 Emission			Annual CO_2 Neutralization		
	Description	Energy Quantity	CO_2 Emission (Tons)	Description	Parameters	CO_2 Neutralized (Tons)
1.	Electricity	73,438 kWh	60.2	Mature Tree	200 No's	4.4
2.	Wood	12.0 Tons	21.9			
3.	Diesel	3,545 Litres	9.4	Electricity (DG)	463 kWh	0.4
4.	LPG	1,888 kg	5.7			
Total Emission			97.2	Total-Neutralized		4.8
Balance CO_2 to be Neutralized = 92.4 Tons/Annum; Per capita Consumption = 0.31 Tons/Person						

(Note: No. of Students, Faculty & Staff for the year 2023-24 is 300)

5.3: Calculation Table:

For Electricity = $\left[\text{kWh} \times \frac{0.82 \text{ kg of CO2 emission}}{\text{kWh}}\right]$

For Wood = $\left[\text{Wood Consumption (Tons)} \times \frac{1.8 \text{ kg of CO2 emission}}{\text{Tons of Wood Consumption}}\right]$

For Diesel = $\left[\text{Diesel Consumption (Litre)} \times \frac{2.64 \text{ kg of CO2 emission}}{\text{Litre of Fuel Consumption}}\right]$

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For LPG = $\left[\text{LPG Consumption (kg)} \times \frac{\text{3.0 kg of CO2 emission}}{\text{kg of LPG Consumption}}\right]$
A mature tree is able to absorb nearly CO_2 at a rate of 21.8 kg/annum; $\frac{(21.8 \times 300)}{1{,}000} = 4.4 \frac{\text{Tons}}{\text{Annum}}$

5.4: Recommendations:

From the above discussion points; it is evident that activities taken forward to neutralize the CO_2 is predominant and to become a Net-Zero Carbon Emission buildings. The management has to plan several activities achieve the target.

- Increase the foot print of trees planted inside the college campus.
- Encourage the students to plant more trees and account them all.
- It is a right time to install considerable amount of roof top solar PV plant and generate the electricity. This must reduce the utility supply and hence reduce the direct CO_2 reduction.
- **As per the Solar Policy-2019** from Government of Tamilnadu; for any educational institutions have to implement substantiate a minimum of **6 % of its energy generation from renewable energy source**.
- Convert existing convention street lightings into solar based battery-operated lightings.
- Identify higher fuel consuming vehicle and either rework or replace it.
- Conduct training programmes for the transport staffs at regular interval and encourage them to maintain the vehicles at good condition throughout the year.

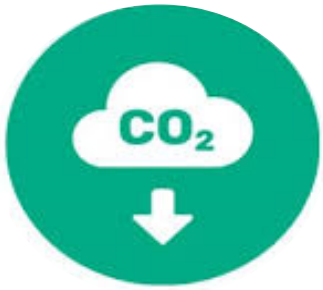
5.5: References:

[1] https://ecoscore.be/en/info/ecoscore/co2

[3]http://www.tenmilliontrees.org/trees/#:~:text=A%20mature%20tree%20absorbs%20carbon,the%20average%20car's%20annual%20mileage

CO_2 Emission:

97.2 Tons/Annum



Planned CO_2 Reduction

4.8 Tons/Annum

CO_2 to be Neutralized

92.4 Tons/Annum

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PART-B: ENVIRONMENT AUDIT REPORT

5. TRANSPORT & REFRIGERANT GASES IN AIR CONDITIONING SYSTEM

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6.1: List of Transport Vehicles:

Pollution level of all vehicles are regularly monitored and are maintained within the prescribed limit since the college is committed to provide green environment for better atmosphere. The list of transporting vehicles along with their type of engine are represented in Table-5.

Table-5: List of Transporting Vehicles available in the College

S. No.	Type of Vehicle	Fuel used	No. of vehicles	Pollution certified (Y/N)
1.	Bus	Diesel	03	Yes
Total No. of Vehicles			**03**	Yes

6.2: Details of Pollution Free Transport Vehicles & Copy of Pollution Certificate:

- The college is committed to green environment not only in the campus; but also, to the entire atmosphere. In order to commute the students and staff; the management is operating vehicle services from various places to the college.
- These vehicles are well maintained by a set of dedicated bus operators and are continuously monitored by the management officials.
- No history of accidents (either major and/or minor) for the past five years. Maintaining best performance on the engine, tyre and other accessories.
- Maintaining proper records on each trip, fuel consumption, distance travelled, no. of passengers and mileage (kmpl)
- All the drives and helpers are well experienced with good track records on i) fuel economy, ii) maintenance free operation, iii) accident free and iv) student friendly.
- All the vehicles are checked periodically and are having valid pollution certificate and certificate of insurance. These vehicles are fitted with Bharat Standard (BS)-IV type engines. However, the management has a commitment to convert the vehicles to BS-VI; once the life time of the vehicles are ended.
- The college administration is also providing skill development training to the bus operator through renowned experts and improve their productivity. Further the management is also conducting regular medical camps for all the bus operator through which i) complete body check-up, ii) blood pressure, iii) blood sugar level, iv) vision check-up and v) other general medical examination are carried out.
- **High Speed Diesel (HSD)** is used as fuel for all the vehicles; which emits less CO_2 in the atmosphere than compared to conventional fuel. Further; the fuel is procured from a single consumer and hence it maintains the quality and provides good engine life.

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Form 59

[See rules 115 (2)]

Under Control Certificate

Transport Department

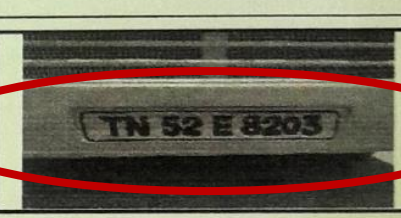
Date : 08/06/2024
Time : 12:45:08 PM
Validity upto : 07/12/2024

Test Validity

Certificate SL. No.	:	TN05200100006330
Registration No.	:	TN52E8203
Date of Registration	:	23/Aug/2013
Month & Year of Manufacturing	:	July-2013
Valid Mobile Number	:	******6959
Emission Norms	:	BHARAT STAGE III
Fuel	:	DIESEL
PUC Code	:	TN0520010
GSTIN	:	
Fees	:	Rs.110.00
MIL observation	:	No

Vehicle Photo with Registration plate
60 mm x 30 mm

Vehicle Number



Sr. No.	Pollutant (as applicable)	Units (as applicable)	Emission limits	Measured Value (upto 2 decimal places)
1	2	3	4	5
Idling Emissions	Carbon Monoxide (CO)	percentage (%)		
	Hydrocarbon, (THC/HC)	ppm		
High idling emissions	CO	percentage (%)		
	RPM	RPM	2500 ± 200	
	Lambda	-	1 ± 0.03	
Smoke Density	Light absorption coefficient	1/metre	2.45	0.31

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC operator
60mm x 20 mm

Cell: 96261 36666
ஸ்ரீ மாருதி வாகன
புகை பரிசோதனை மையம்
3,40-A, சேலம் - கோவை NH
ஆவாரங்காடுபாளையம்,
சங்ககிரி - 637 301.

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Sample Pollution Certificate for a Transport Vehicle

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6.32. Battery Operated Electric Vehicle (EVs):

→ Because of the management perspective; **nearly 03 faculty member** are also using **E-vehicle (two-wheeler)** for their regular visit.

→ This must be a welcome step and more awareness must be created among all the faculty and students.

Passenger E-Vehicle Owned by the Faculty Members

6.3: List of Air Conditioning System along with its Refrigerant:

The list of AC available is shown in Table-6: indicating their quantity, tonnage, type of refrigerant, GWP and ODP.

Table-6: List of Multi-variant AC System, Type of Refrigerant, GWP and ODP Values

S. No.	Location	Rating & TR Capacity	Quantity	Refrigerant Used	Global Warning Potential (GWP)	Ozone Depletion Potential (ODP)
1.	APrincipal room	5 Star & 1.5 TR	1	R-32	675	Zero

- **Note:** The most environment-friendly refrigerants that are available in Indian market currently are "R-290" and "R-600A". They are Hydrocarbons and their chemical names are "Propane" for R-290 and "Iso-Butane" for R-600A
- They are completely halogen free, have no ozone depletion potential and are lowest in terms of global warming potential. They also have high-energy efficiency but are highly flammable as they are hydrocarbons. (Kindly refer: https://www.bijlibachao.com/air-conditioners/comparison-of-various-refrigerants-r-410a-r-22-r-290-r-134a-used-for-air-conditioners-and-refrigerators.html).

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART-B: ENVIRONMENT AUDIT REPORT

7. USAGE OF CHEMICALS, SALTS & ACIDS

(STORAGE, HANDLING & BEST OPERATING PRACTICES)

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7.1: Handling of Chemicals/Salts/Acids used in the Laboratories:

The science departments use chemicals for experimental applications and are having strict safety rules as follows;

- Well trained faculty and lab assistants who have knowledge about the hazardous nature of each and every chemical are only allowed to handle the chemicals safely
- Strictly follow the manufacturer's instruction on the container in order to prevent accidents
- Volatile or highly odorous chemicals, fuming acids are stored in a ventilated area
- Chemicals are stored in eye level and never on the top shelf of storage unit
- All stored chemicals; especially flammable liquids are kept away from heat and direct sunlight. Reactive chemicals are not stored closely
- Hazardous and corrosive chemicals are kept on sand platform to avoid corrosion
- First aid box and fire extinguishers are readily available in the laboratory

7.2: Storage of Chemicals/Salts/Acids:

Less concentrated chemicals, salts and acids are stored in proper racks, cupboards and high concentrated acids are stored in separate area filled with sand.

- Most of the chemicals, salts and acids used in the science departments are inorganic in nature and no harmful effects are created during the experiment process
- However, after completion of each experiment, the wastes are washed in the water sink and are rooted to common choke pit.
- Only trained teaching and non-teaching staffs are handling the chemicals and also, they are well trained to handle any abnormal laboratories with chemicals are well ventilated with proper emergency exits. Adequate and correct sequence of fire extinguishers are placed near all the laboratories

Chemical Placed in a Rack

Concentrated Chemical Bottles Placed in Sand Tray

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Storage of Chemicals/Salts/Acids Storage

7.3: Recommendations:

- ⇒ Display the Dos and Don'ts inside the laboratory
- ⇒ Print the Dos & Don'ts in the Students laboratory manual
- ⇒ During the first class, demonstrate a PPT presentation and explain the safety procedures
- ⇒ Provide training to the teaching and technical staffs member on latest updates on chemical storage, handling, and safe disposal
- ⇒ Also encourage to conduct such type of training programmes by the faculty member to nearby schools and college (as an outreach programme)
- ⇒ Fix the First Aid Box (with all necessary medicines)
- ⇒ Place the names (along with their photo and mobile number) of the professionals training to handle fire extinguishers
- ⇒ Prepare & adopt a **Chemical Policy** (Including procurement, storage, handling, distribution, & disposal

7.4: Use of Chemical for Vessels & Floor Cleaning:

In order to maintain hygiene in the College campus; the administration regularly clean the floors and restrooms. In addition to this, the hostel management has to monitor i) the cleaning of vessels, kitchen floor, dining hall, store room and gas station. Table-7 shows the cleaning agents used to clean the above-mentioned area;

Table-7: Cleaning Agents used for Floor and Vessel Cleaning

S. No.	Cleaning Agent	Application
1.	Vessel Cleaning Soap	Vessel Cleaning
2.	Soap Oil & Bleaching Powder	Floor Cleaning

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Cleaning & Refreshing Agents used for Vessel & Floor Cleaning

7.5: Recommendations: Eco Friendly – Green Cleaning Agents:

- It is recommended to use natural ingredients like orange peel extract & vinegar. It leaves a mild and pleasant fragrance after use. The formula is free from all harmful chemicals & toxins. It is pH-neutral, gentle on the skin as well as on the surface where it is used
- Also, these products are **IGBC GreenPro** certified. GreenPro is a mark of guarantee that the product is environment friendly throughout its life cycle

Green Pro Certified Eco-Friendly Cleaning Agents (ZERODER)

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART- C: GREEN AUDIT REPORT

8. WATER UTILIZATION, CONSERVATION & WATER MANAGEMENT

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8.1: Source of Water, Storage and Distribution:

Table-8 shows the source of water, location of storage along with their application.

Table-8: Source of Water, Location of Storage and Application

Type of Water	Source	Application
Bore Water	**1 Nos (350 ft depth each)** Inside the College: 1 No.	Utensil Cleaning, Bathing & Cloth Washing
Rain Water Harvesting (RWH) Pits (Building run-off)	Collected from located in the Main Buildings – **02 Nos**	↗ Used to increase the ground water ↗ To store building run-off only

8.2: Details of the Water Utilities, Storage, Motor Capacity and Approximate Run Hours:

The following table provides the details of the Water Utilities, Storage, Motor Capacity and Approximate Run Hours available inside the college for regular application.

Table-9: Details of the Water Utilities, Storage, Motor Capacity and Approximate Run Hours

S. No.	Location	Depth	Motor Capacity	Storage
1.	Bore (Inside the College)	350 ft	3.7 kW/5 HP	Directly lifted to Over Head Tank (HDPE) located in the Main Boiling **(5,000 L x 2 Nos)**

Note:

- ☞ All the Over Head (OH) tanks are made using cement construction.
- ☞ The maintenance team ensure to clean the tank for every six months (Twice in a year)
- ☞ Bleaching power is mostly used to clean the inside tank.

8.3: Treated Water for Drinking Application:

- The college management is keen on providing uninterrupted, safe and healthy drinking water to all; throughout the year.
- Water dispenser are provided at appropriate places offering the treated water for the students (Both Normal and Hot temperature)
- The overhead tanks storing the well water are cleaned at regular intervals and the water management team has been maintaining a cleaning schedule Utensil Cleaning, Bathing & Cloth Washing.

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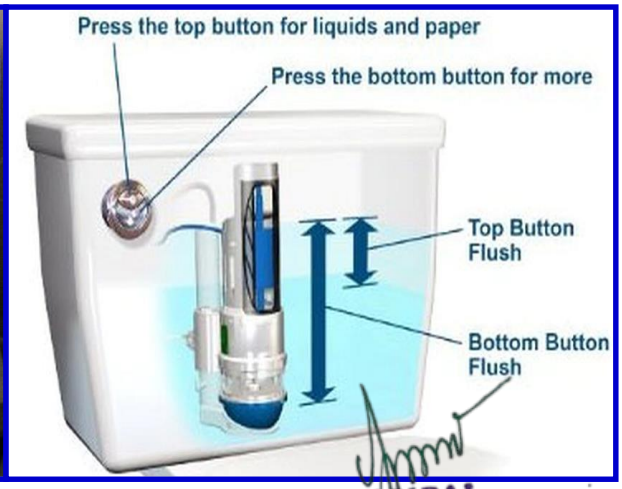
8.4: Water Savings in Foreign Toilets:

- The list of availability of Indian & Foreign style toilets are presented in the below Table-10.

Table-10: List of Indian & Foreign Style Toilets

S. No.	Location	Description (Quantity)	
		Indian	Foreign
1.	Overall College Area	10	02
Total		**10**	**02**

- In general, the flush tank capacity may be 8 to 10 Litres (depends on make and model). Water savings also leads to power saving it saves the operating duration of the water pumps directly.



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8.5: Rain Water Harvesting (RWH) – from Building Roof Area & Run-off Area:

- The audit team appreciates the effects taken by the management of **SS INSTITUTE OF PHARMACY** for harvesting the rain water almost in all buildings.
- **02 Nos of RWH** pits are erected and in operation to capture the building run-off rains in the entire university (Almost all high-rise building has one RWH with adequate capacity)
- The roof area is so arranged to collect the rainwater and then passed through proper piping system, and then bring back to the RWH pits which are located close to each pit
- The building run off are collected through each pit mostly located in each building. Common area and road run-off are properly collected and routed to nearby water body.

Building Roof Run off based Rain Water Harvesting System

8.6: General Recommendations for Rain Water Harvesting:

- RWH has been fitted with their specifications indicating their i) year of installation, ii) approximate average rainfall and duration in the RWH location and iii) filter cleaning schedule (if any).
- Conduct a GIS based study on the improvement of ground water table especially before the rainy session and after rainy session. Compare the data and ensure that the water table improves due to percolation of rain water.
- Similar study mast be conducted (in future) before installing an RWH and after RWH.
- Increase the no. of RWH pits and may be developed to place at least 2 per building.

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Sample Name Board in front a Rain Water Harvesting System

8.7: Recommendations - Water Saving Boards:

It is recommended to place **SAVE Water** boards at appropriate places and ensure that, this will be done as a student movement.

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8.8: General Recommendations:

→ It is advisable to replace all the old taps without aerator into aerator-based taps in a phased manner.

→ Aerators helps to reduce and regulate water flow and also offer the following benefits;

- ✓ Lower Water Bills & Improved Water Pressure
- ✓ Increased Filtration & Minimized Splashing

- All the pump motor must be fitted and controlled by floating sensor and hence the motors are automatically ON and OFF. It avoids the overflow; saves water and electrical energy.
- All the buildings are fitted with water flow meters & hence the water utilization must be properly accounted. Similar to the water flow meter; energy consumption of all pumping motors is recorded using panel board meters.
- Fault and leakage in the water distribution line will be promptly informed by the respective in-charges to the maintenance team and immediately arrested.

8.9: Installation on Fire extinguishers:

- The college has installed Fire extinguishers at all the vulnerable points.
- They are also refilled and in good condition (with adequate pressure indicated in the meter)

Sample Fire extinguishers & First Aid Kit Placed in the College

8.10: Recommendations:

- ↗ The extinguisher is not blocked by equipment, coats or other objects that could interfere with access in an emergency.
- ↗ The pressure is at the recommended level. On extinguishers equipped with a gauge (such as that shown on the right), the needle should be in the green zone - not too high and not too low.
- ↗ The nozzle or other parts are not hindered in any way.
- ↗ The pin and tamper seal (if it has one) are intact.
- ↗ There are no dents, leaks, rust, chemical deposits and/or other signs of abuse/wear. Wipe off any corrosive chemicals, oil, gunk etc. that may have deposited on the extinguisher.

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PART – C : GREEN AUDIT REPORT

9. WASTE HANDLING

&

MANAGEMENT

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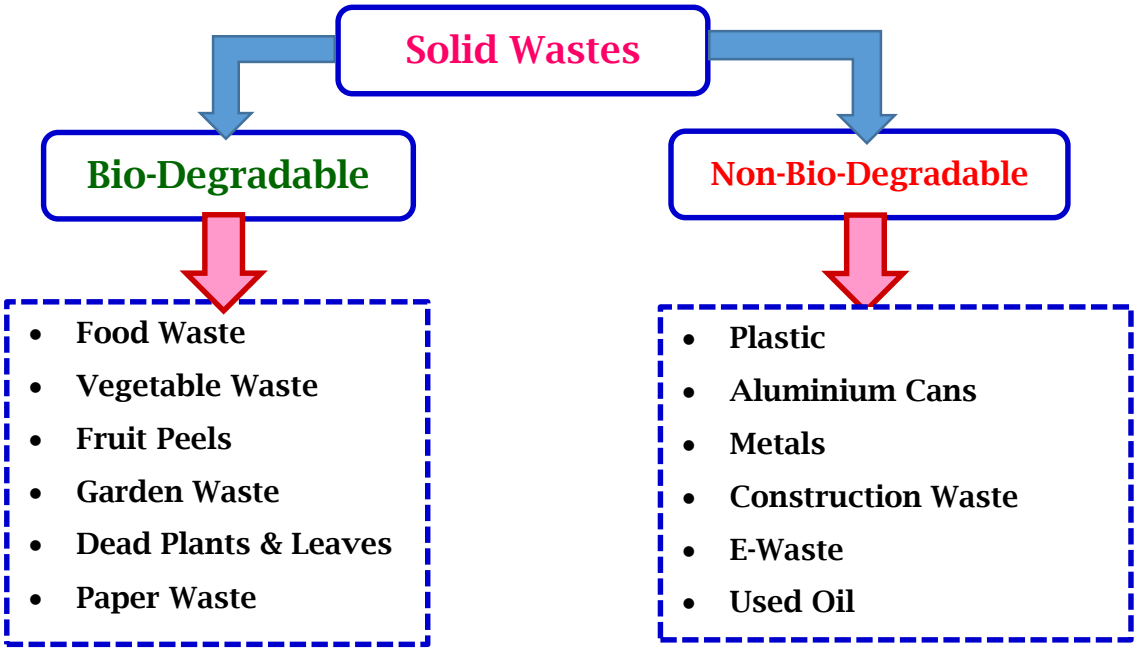
9.1: Solid Waste Management System:

Different types of wastes generated inside the college premises are represented in the block diagram given below.



9.2: Process of Waste Management:

The college management practised some methods to treat the waste generated and Table-11 shows the process of treating the solid waste generated inside the college campus.

Table-11: Process of Waste Management

S. No.	Waste Type	Waste Treatment
Bio-Degradable Waste Management		
1.	Food and Vegetable Waste	• Collected and given to nearby fam
2.	Garden Wastes and Plant Leaves	• Daily collected and dumped in a yard
3.	Paper Waste	• Collected and stored in a separate place
		• Sold to third party for recycling
		• Daily paper waste stored in a yard
Non-Bio-Degradable Waste Management		
4.	Plastics	• Banned in the college campus **(Welcome step).** • The chemical/salt storage containers are disposed to third party
5.	Transport Oil + Tyres	Stored in a separate place and sold to third party
6.	DG Engine oil & Coolant	Stored in a separate place and sold to Construction Purpose Only
7.	Vehicle& Computer Batteries	Procuring new batteries with buyback offer (old battery replacement)

8.	Used edible oil	Almost zero waste. Mostly used for internal cooking and frying.
9.	E-Waste Management	Used for sale to third party for recycling

9.3: Standards Followed for Waste Handling & Management:

1. Solid Waste Management Rules – 2016
2. E-Waste Management Rules – 2016
3. Hazardous Waste Management Rules – 2016 (Management & Transboundary)
4. Battery Management Rules – 2001 (Management & Handling)

9.4: General Note:

- Prepare a flow chart for collection of E-waste from Generation to Disposal and paste it on appropriate places
- An electronic weighing scale (with suitable capacity) must be installed in the storage yard and should be properly calibrated
- One emergency lamp (with UPS supply) must be installed along with suitable fire extinguisher. Ensure proper ventilation in the yard
- Form rule for declaring the waste as E-Waste & Assign the singing authorities
- Identify a third-party vendor to procure the E-waste from the college
- Establish MoU with that party. Disseminate the following information at appropriate places i) E-Waste Policy, ii) Process Methodology, iii) Copy of MoU with third party vendor, iv) Contact persons mobile number and E-mail.
- Identify certain vehicle to carry the waste from generation to storage yard
- Provide training to the man power who are handling the waste
- Maintain separate Delivery Challan, Billing, weighing mechanism for handling the E-Waste
- Update the status of E-waste (through digital circular) to all the concerned management representatives, faculty members and staff at regular intervals (month wise is good)

Solid Waste Management (Collection, Segregation, Storage & Safe Disposal)

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART - C: GREEN AUDIT REPORT

10. ASSESSMENT ON MATURE TREES, & BIO-DIVERSITY

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10.1: Campus Greenery:

The college is completely covered with mature trees grown for more than 10 years. The total number of mature trees available in the college campus is ***20 with many varieties of trees.***

Table-12: List of Mature Trees available in the College Campus

S. No.	Location	Name of the Tree	Quantity
1.	Entire Campus Location	Variety of Mature Trees	200

Total No. of Mature Trees available in the college campus is 200 which contributes for reduction of 4.4 Tons of CO_2 emission/Annum

10.2: Bio-gas Plant Generating Cooking Gas:

- **SSIP** has implemented a Bio-gas (natural fuel) plant generating energy from food and vegetable wastes daily generated in mess and canteen.
- Production of biogas obtained from **"anaerobic digestion"** which consists in micro-organisms breaking down complex organic substances (lipids, protides, and glucides), contained in plants, sludge and by-products of animal origin.
- Biogas is primarily methane (CH_4) and carbon dioxide (CO_2) and may have small amounts of hydrogen sulphide (H_2S), moisture and siloxanes. The gases methane, hydrogen, and carbon monoxide (CO) can be combusted or oxidized with oxygen.
- Food waste generated from cooked rice, cut portions of vegetables and non-used vegetables waste. This waste is crushed by mixer grinder and slurry was prepared by adding water.

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10.3: Recommendations to Grow Indoor Plants as Natural Air Purifier:

- Indoor plants not only do plants look good while bringing life to our living space, they also help purify the air, according to a NASA study that explains that even a small plant inside the workspace can help remove at least three household toxins (benzene, formaldehyde, and trichloroethylene)

TULSI: Generates more oxygen per day

Aloe Vera:

- **Removes benzene and formaldehyde**
- **Eliminate harmful microorganism and absorb dust**

Snake Plant:

- **Removes Xylene, Benzene, Formaldehyde, Trichloroethylene toxins.**

Spider Plant:

- **Removes CO and Formaldehyde**
- **Absorbs Nicotine**

Money Plant (Devil IVY):

- **Best air purifying plant**
- **Remove benzene & Formaldehyde**

Bosten Fern:

- **High humidity application**
- **Remove xylene & Formaldehyde**

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Chrysanthemum:

- **Removes Ammonia, Xylene, Benzene & Formaldehyde**

Kimberly Queen Fern:

- **Works well in carriage**
- **Absorb vehicular exhaust**

10.4: Recommendations for Miyawaki Forest:

Miyawaki is a technique (also called *Potted Seedling Method*) as that helps build dense, native, multi-layered forests. The approach is supposed to ensure that plant growth is 10 times faster and the resulting plantation is 30 times denser than usual. It involves planting dozens of native species in the same area, and becomes maintenance-free after the first three years. The overall density of the forest is beneficial in lowering temperature, making soil nutritious, supporting local wildlife and sequestration of carbon.

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10.5: Bio-Diversity in the Campus:

- Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world.
- Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life.
- Biodiversity supports everything in nature that we need to survive: food, clean water and shelter.
- **SSIP is blessed with more varieties of resident birds (species always living inside the campus)** and amphibians (Amphibians are small vertebrates that need water, or a moist environment, to survive).

10.6: Recommendations to maintain Bio-Diversity:

- **Bird Sighting and Survey:** Conduct a dedicated bird sighting and identify the list of birds both residing birds and migratory birds available in the college campus
- Prepare the list of birds with their local name, scientific name, their average life time, nesting facility created by the bird and photo of the bird. Show case the result to all the stake holder and inculcate a habit of friendly environment
- Discuss with the ornithologists and facilitate the environment with more birds coming to the campus and especially migratory birds.
- **Reptile & Amphibian survey:** Similar to bird survey; conduct a survey to list the amphibians available in the campus
- Amphibian and reptile surveys are often performed as part of the Green Audit process or terrestrial survey. These surveys are effective at detecting the presence of even the most elusive species.

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

11. AUDIT SUMMARY & CONCLUSION

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SUMMARY OF THE AUDIT PROCESS:

In order to make the **SS INSTITUTE OF PHARMACY** campus **100 %** Environmental sustainability and lush Greenery; the audit team recommends to implement the following measures:

I. Energy Conservation & Management – Electrical Energy:

- In a phased manner, ceiling fans must be changed from conventional fans into BLDC fans. Also change FTL into LED with adequate illumination levels
- Implement Energy Management System (EMS) to accurately measure & monitor energy flow
- Implement automatic street light controller to turn on and off based on different time in a day. Use astrological timer for better results and energy savings
- Prepare suitable formats for all energy consumption and regularly follow the records. At regular intervals conduct internal audits to assess the effectiveness of the practice. Make proper corrections; if it deviates from the standard operating procedure
- Regularly conduct i) Illumination study, ii) Thermal comfort study, iii) Flue gas study on DG, and Boiler, iv) Water quality assessment (for all types of water utilized) and v) Indoor and ambient air quality study.
- Regularly clean the stove burners and ensure that the flame should be in light bluish colour

II. Water Conservation & Management:

- Utilize more amount of treated water; since most of the approving agencies like AICTE, UGC etc., are now requesting to utilize the treated water
- To check the quantity of water utilized by each building by connecting digital water flow meter and optimize the water usage
- Prepare and maintain a Single Line Diagram (SLD) for water distribution network.
- Try to reduce water tapped from the ground water source since it is not environmentally friendly
- Paste water and energy saving slogans at appropriate places
- Generate your own power and water for regular activities and move towards Net Zero Energy and Net Zero Water Building
- Retrofit aerator-based water taps for good water savings. For hand washing applications, all the pipes must be fitted with aerators
- Captures almost 100 % rain water harvesting through i) Recharging pits and ii) Open well type storage pits
- Properly follow scientific method of handling chemicals/Acids/Salts and safe disposal through 3rd party
- Water treatment log must be maintained indicating the water inlet, treated and outlet water quantity
- Install **sensor-based water controller** in each Over Head Tanks and reduce the water waste and power required to operate the pump
- With the advent of smart technologies, it is possible to have centralized monitoring in real-time using Internet of Things (IoT), Geographic Information System (GIS) software, etc. as per **Jal Jeevan Mission,** Department of Drinking Water & Sanitation **Ministry of Jal Shakti**
- Awareness campus must be conducted to all the stakeholders at regular interval. Through this initiative; Painting, Photography, Slogan and Poster making contest are conducted to create consciousness among the students and faculties

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III. Impart Training to Faculty and Technical Staffs:

- **Energy Conservation and Management**
- **Environmental impact and assessment**
- **Fire and Safety (Operation and Handling)**
- **Electrical maintenance, AC, Battery Maintenance & Safety**
- **Emergency Preparedness**
- **E-Waste, Chemicals Handling & Solid Waste Management**
- **Training for Transport employees**
- **Training for Faculty and Students on Vehicle Operation**
- **Training for Kitchen Employees**
- **General Medical Camps for Employees**
- **Training on Stress Management and Yoga**

IV. Way Forward towards Energy & Environmental Sustainability:

- Prepare an exclusive **Energy and Environment Policy** based on the energy and environment practices followed in the campus. This must reflect the i) Present energy consumption & generation, ii) Projection of energy need, iii) Commitment by the college to conserve energy (in terms of percentage), iv) Road map to achieve the commitment, v) Facilities needed to achieve the same, vi) Roles and responsibilities of all stake holders, vii) Interim and final review mechanism, viii) Corrective measures, if the results deviates from the committed value and ix) Benchmarking, Case study preparation, Knowledge sharing and rewards
- Practice appropriate ISO standards for System Management. The audit team highly recommend to follow **i) ISO-9001 (Quality Management System), ISO-14001 (Environmental Management System) and ISO-50001 (Energy Management System)**
- Working towards Net Zero Energy and Net Zero Water Campus and achieve **Platinum rated Global Leadership campus (as per IGBC rating)** and/or **5-star rated campus** (as per GRIHA rating) and/or **GEM-5 rated campus** (as per ASSOCHEM GEM rating)

COMPLETION OF THE REPORT

This report is prepared as a part of the Energy, Environment and Green Audit process conducted at **SS INSTITUTE OF PHARMACY,** NH-544, Salem – Coimbatore Highways, Manjakalpatti, Kuppanur Post, Sankari (Tk), Salem (Dt), Tamil Nadu – 637 301 by **RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING,** Coimbatore-641 109 Tamil Nadu, India.

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

ANNEXURE:

AUTHORISED CERTIFICATES OF THE AUDITOR

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Reg No.: EA-27299

Certificate No.: 9645/19

NATIONAL PRODUCTIVITY COUNCIL

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr./ Mrs./ Ms. **SIVARASU SULUR RATHINAVELU**

son / daughter of Mr. **P RATHINAVELU** *has passed the National certification Examination for Energy Auditors held in September 2018, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India. He / She is qualified as* ***Certified Energy Manager*** *as well as* ***Certified Energy Auditor****.*

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

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

Digitally Signed by:K V R RAJU
Mon Apr 22 16:22:42 IST 2019
Controller of Examination, NPC AIP Chennai

Place : Chennai, India
Date : **22nd April, 2019**

Controller of Examination

TÜV NORD

ISO 14001:2015 Lead Auditor
(Environmental Management Systems)
Training course

it is hereby certified that

Dr. S. R. Sivarasu

has successfully completed the above mentioned course and examination

08th - 12th December 2017

Coimbatore, India

Certificate No. 3521 2982 02
Delegate No. 71968

for TÜV NORD CERT GmbH

Essen, 2018-01-11

Course 18125 is certified by CQI/IRCA and meets the training requirements for those seeking certification under the IRCA EMS auditor certification scheme.

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.com

CQI | IRCA CERTIFIED COURSE

CQI | IRCA APPROVED TRAINING PARTNER

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IGBC

Confederation of Indian Industry

The Indian Green Building Council

hereby certifies that

Sivarasu S R

has successfully demonstrated knowledge on the Green Building Design & Construction, Building Standards & Codes, IGBC Resources & Processes and Green Design Strategies & their Impacts, required to be awarded the title of

IGBC Accredited Professional

K S Venkatagiri
Executive Director
CII-Godrej GBC

V Suresh
Chairman
Indian Green Building Council

Gurmit Singh Arora
Vice-Chairman
Indian Green Building Council

200239

20 June 2020

GRIHA

GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT

GRIHA CERTIFIED PROFESSIONAL CERTIFICATE

This is to certify that

Sivarasu sr

has qualified as a **GRIHA** Certified Professional For V. 2015

Date of Issue: 18th September 2020

Note : This certification is valid only for GRIHA version 2015.

Chief Executive Officer
GRIHA Council

PRINCIPAL
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Confederation of Indian Industry

This is to certify that

SIVARASU S R

is a

CII Certified Professional in Sustainable Waste Management

K S Venkatagiri
Executive Director
CII - Godrej GBC

Pradeep Bhargava
Chairman
CII GreenCo Council

IGBC

E-Learning

Issued by CII Sohrabji Godrej Green Business Centre | Issued on 9 June 2021 | CIGBC-SWM-0621-298

HSSERisk Academy

CERTIFICATE

OF APPRECIATION

EMPOWERING PEOPLE THROUGH KNOWLEDGE TRANSFER

THIS CERTIFICATE IS AWARDED TO

Sivarasu Rathinavelu

FOR SUCCESSFUL COMPETION OF TRAINING COURSE ON

ISO 14064-1:2018
ISO 14064-2:2019
ISO 14064-3:2019
ISO 14066:2011
ISO 14067:2018

AND CERTIFY HIM/ HER AS

IMPLEMENTOR & AUDITOR
CARBON FOOTPRINT MANAGEMENT

This certificate is awarded for successful completion of Global Virtual Training course conducted from August 27, 2021 to September 01, 2021. It's serves as a proof of his/her knowledge, competence and ability to implement, verify and validate carbon footprint as per above mentioned standards and methods. This certificate was awarded on August 01, 2021.

01.09.21
DATE

SIGNATURE

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