# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

***DETAILS OF THE CLIENT***

**K. RAMAKRISHNAN COLLEGE OF ENGINEERING**

**(AUTONOMOUS)**

**NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112.**

**(Audited and accounted from June 2024 to May 2025)**

***DATE OF AUDIT***

**18 JUNE 2025**

***AUDIT CONDUCTED AND SUBMITTED BY***


**RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING**

**(An ISO 9001:2015 Certified Company & Registered under MSME, GoI)**

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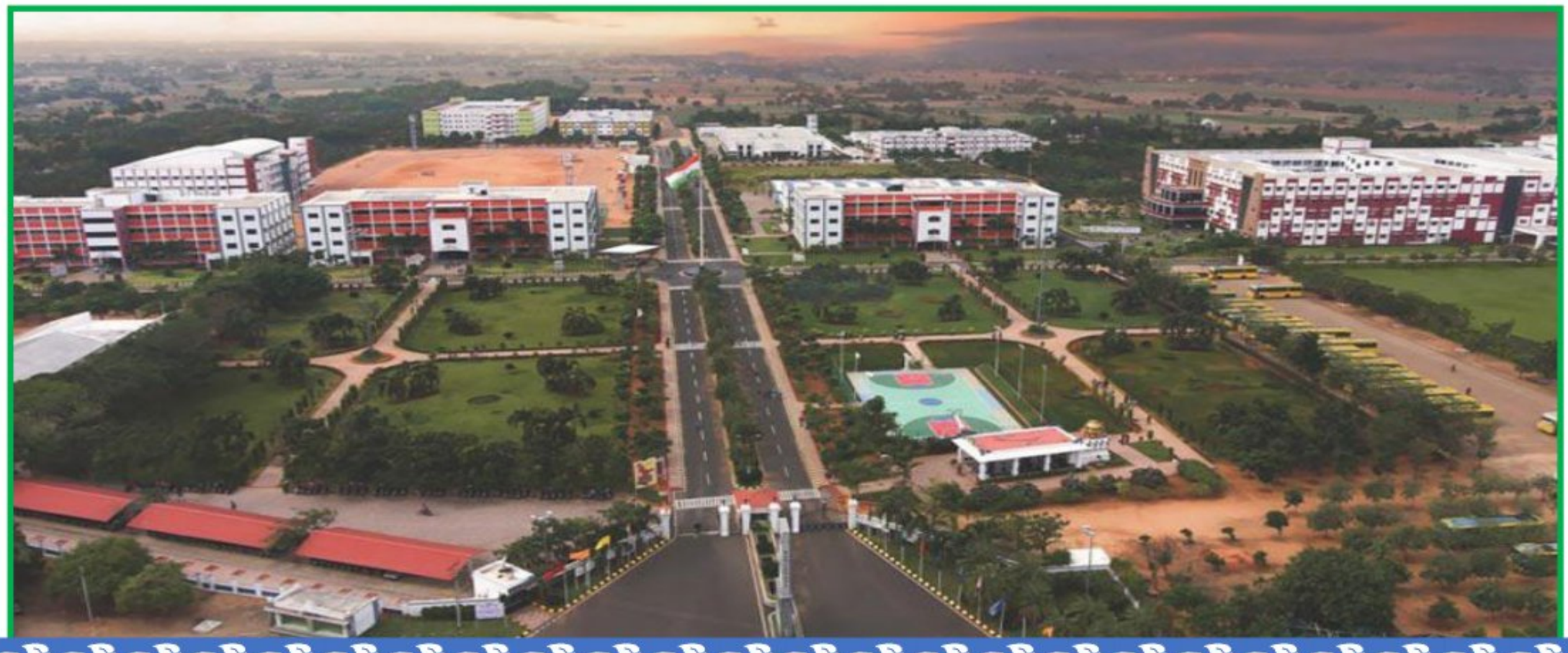

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# 1. ACKNOWLEDGEMENT

Energy Earns or Simply Burns: Choice is yours....





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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 **K. RAMAKRISHNAN COLLEGE OF ENGINEERING,** I NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112, 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 **K. RAMAKRISHNAN COLLEGE OF ENGINEERING** 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.

| ***Audit Team Member*** | |
|---|---|
| **Dr. S.R. SIVARASU, Ph.D.,** | **BEE Certified Energy Auditor (EA-27299)**<br>Lead Auditor-ISO-14001:2015 (EMS),<br>IGBC AP, GRIHA CP, CII CP in SWM<br>Carbon Footprint Auditor & Implementor<br>**Mobile: +91- 80567 19372,**<br>**99420 29372** |



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**K. RAMAKRISHNAN COLLEGE OF ENGINEERING**

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# 2. INTRODUCTION TO ENERGY-ENVIRONMENT-GREEN AUDIT



## ***2.1: Preface about the Institution:***

- ✓ **K. RAMAKRISHNAN COLLEGE OF ENGINEERING** established in the year 2008 is a leading Engineering college affiliated to Anna University, Chennai, providing valuable courses. It is located in the famous town of Shri Samayapuram Mariyamman temple, on the sprawling campus of 30 acres with a panoramic and pleasant view.
- ✓ It has been accredited by NAAC with 'A' grade. The college has got its autonomous status in 2020 conferred by UGC and it also has got NIRF ranking with the band 201-300 under Engineering Category during 2023-2024.
- ✓ Our college offers 8 Under Graduate programs such as B.E – Mechanical Engineering, Electronics and Communication Engineering, Computer Science and Engineering, Electrical and Electronics Engineering, Computer Science and Engineering (Artificial Intelligence and Machine Learning), B.Tech - Artificial Intelligence and Data Science, Information Technology and Computer Science and Business Systems.
- ✓ The College also provides 5 Post Graduate Programs such as M.E – Computer Science and Engineering, Engineering Design, Communication Systems, Power systems Engineering and Master of Business and Administration.
- ✓ Four departments of our college CSE, EEE, ECE and MECH were accredited with NBA. Our college has Exclusive Entrepreneurship Development Cell (EDC) and IPR cell to promote entrepreneurship zeal among the students.
- ✓ In order to promote the job opportunity in foreign countries, foreign languages such as Japanese, German and French are taught consecutively.
    - Permanent Anna University affiliation for CSE, ECE, EEE, Mechanical, & MBA departments.
    - Recognized by UGC under section 2(f) and 12(B).
    - Received Autonomous Status for a period of ten years from 2020-21 to 2029-30 from UGC.
    - Certified by ISO 9001:2015
    - Accredited by NAAC with A grade.
    - NBA accreditation for four programs: Computer Science and Engineering (CSE), Electronics and Communication Engineering (ECE), Electrical and Electronics Engineering (EEE) and Mechanical Engineering (MECH).
    - Anna University approved Research Centers in the Departments of ECE, EEE and Mechanical.
    - ANNA UNIVERSITY RANK LIST: State First Position in Anna University Odd and Even Semester Examination Results - 2013.
    - Crowned with 213 Anna University Rank Holders.
    - Student Affairs Cell aims to assist our students in exploring opportunities for higher education abroad.
    - 50+ MoU's with different industries and institutions.
    - IPR: 499 Patents Filed, 133 Patents Granted, 299 Patents Published.
    - Placements from top companies like TCS, Cognizant, IBM, ZOHO Corporation, Hexaware, Accenture, TECH Mahendra, Musigma, LTIMIND Tree, Virtusa, Genpact, Avasoft , Ford Motors and KAAR Technologies and many more.



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- Recognized as a Host Institute by the Ministry of Micro, Small and Medium Enterprise (MSME).
- The Ministry of Skill Development & Entrepreneurship (MSDE), Govt. of India, is implementing the flagship skill development scheme of Government of India - Pradhan Mantri Kaushal Vikas Yojana 4.0 (PMKVY 4.0). Accordingly, K. Ramakrishnan College of Engineering, has been allocated 30 targets for implementing training under PMKVY4.0
- Unnat Bharat Abhiyan (UBA), has been approved by the Ministry of Education (MoE) Government of India and adopted 5 villages in and around KRCE through this scheme to leverage the rural development

## ***2.2: Vision:***

- To achieve a prominent position among the top technical institutions

## ***2.3: Mission:***

- To bestow standard technical education par excellence through state-of-the-art infrastructure, competent faculty and high ethical standards.
- To nurture research and entrepreneurial skills among students in cutting edge technologies.
- To provide education for developing high-quality professionals to transform the society.

## ***2.4: Major Activities in the Institution:***






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## *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

## *2.6: Outcomes of the Audit Process:*

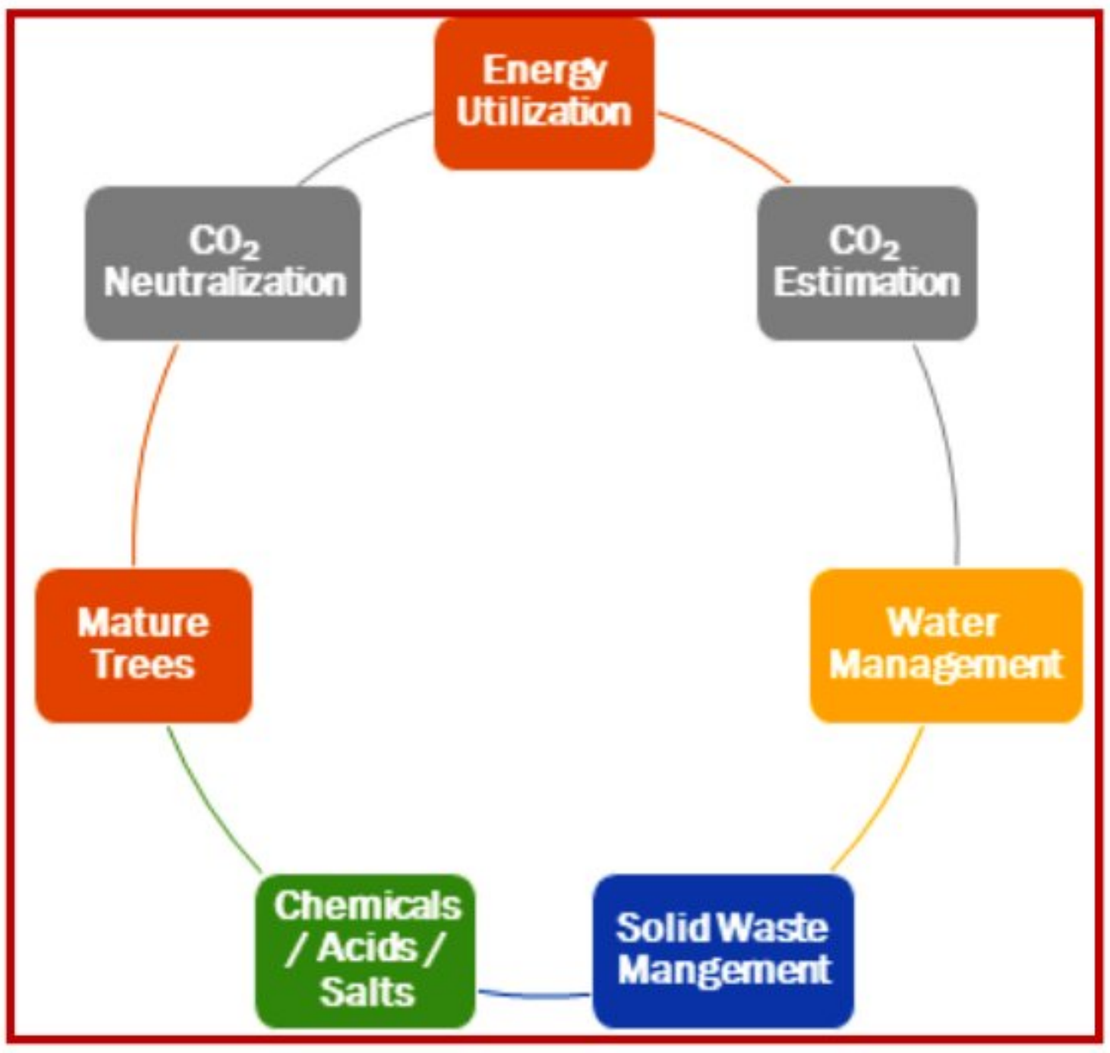
- Recommendations based on field measurement with achievable **En**ergy **Con**servation (ENCON) proposals under **No cost/Low cost and Cost investment categories**
- **Minimization of present energy cost** by adjusting and optimizing energy usage and reduction of energy wastage without affecting the 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 machine (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.

## *2.8: Coverage in Energy- Environment & Green Audit Process:*



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**K. RAMAKRISHNAN COLLEGE OF ENGINEERING**

NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112.

# 3. ESTIMATION OF $CO_2$ EMISSION AND NEUTRALIZATION

## (ELECTRICITY, DIESEL, LPG, WOOD, SOLAR THERMAL, BIO GAS & TREES)






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### ***3.1: Assessment of Annual Energy Usage:***

Table-1 shows the types of energy carriers used for their regular operation in the college campus along with application area and their source.

**Table-1: Energy Carriers and their sources used for College Operation**

| S. No. | Type of Energy Carrier | Application Area | Source of Procurement |
|---|---|---|---|
| 1. | Electricity (HT Service - 01 No) | Powering to all electrical / electronic / HVAC equipment's | From TANGEDCO |
| 2. | Solar PV System (150 kW) | | Installed in Roof Top and Captive Power Generation |
| 3. | Diesel | Transport vehicles and Diesel Generator (Captive Generation) | From authorised distributor |
| 4. | Liquified Petroleum Gas (LPG), Bio Gas & Wood | Used only for cooking | |
| 5. | Mature Trees, Bushes & shrubs | The college has nearly **1,769 mature trees** of different varieties which are more than **10 years old.** | |

**Table-2: Analysis of Annual Energy Consumption of all types of Fuels (2024-2025)**

| S. No. | Month | Electricity (kWh) | LPG (kg) | Bio gas (kg) | Solar (kWh) | Wood (Tons) | Diesel Consumed (L) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | DG | Transport | Total |
| 1. | Jun-24 | 58,199 | 829 | 818.4 | 7,280 | 1.09 | 345 | 2,787 | 3,133 |
| 2. | Jul-24 | 49,829 | 622 | 816.8 | 6,500 | 1.09 | 11 | 1,870 | 1,881 |
| 3. | Aug-24 | 66,902 | 829 | 817.9 | 6,920 | 1.09 | 466 | 3,521 | 3,987 |
| 4. | Sep-24 | 69,706 | 829 | 545.6 | 7,620 | 1.09 | 450 | 3,732 | 4,182 |
| 5. | Oct-24 | 69,636 | 1,037 | 528.1 | 6,740 | 1.09 | 13 | 3,462 | 3,476 |
| 6. | Nov-24 | 64,624 | 1,451 | 463.8 | 4,900 | 1.09 | 135 | 3,715 | 3,850 |
| 7. | Dec-24 | 56,050 | 1,451 | 474.7 | 6,040 | 1.09 | 307 | 2,624 | 2,931 |
| 8. | Jan-25 | 43,701 | 1,037 | 545.6 | 5,840 | 1.09 | 391 | 3,036 | 3,426 |
| 9. | Feb-25 | 52,942 | 1,244 | 545.6 | 7,820 | 1.09 | 39 | 2,504 | 2,543 |
| 10. | Mar-25 | 71,854 | 1,244 | 632.9 | 9,020 | 1.09 | 28 | 3,070 | 3,098 |
| 11. | Apr-25 | 69,367 | 1,037 | 601.3 | 7,680 | 1.09 | 240 | 2,941 | 3,181 |
| 12. | May-25 | 73,370 | 1,451 | 654.7 | 9,160 | 1.09 | 634 | 3,304 | 3,938 |
| **Total** | | **7,46,180** | **13,062** | **7,445** | **85,520** | **13.0** | **3,059** | **36,567** | **39,626** |

- **The cost of the electricity is Rs. 12.00/kWh.**



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### *3.2: Environmental System: $CO_2$ Balance Sheet (2024-25):*

→ $CO_2$ 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-3: Environmental System: $CO_2$ Balance Sheet (2024-25)**

| S. No. | Annual Energy Consumption & $CO_2$ Emission | | | Annual $CO_2$ Neutralization | | |
|---|---|---|---|---|---|---|
| | **Description** | **Usage** | **Emission (Tons)** | **Description** | **Usage** | **Neutralized (Tons)** |
| 1. | Electricity | 7,46,180 kWh | 611.9 | Electricity-DG | 10,488 kWh | 8.6 |
| 2. | Diesel | 39,626 Litres | 104.6 | Solar PV Thermal | 85,520 kWh | 70.1 |
| 3. | LPG | 13,062 kg | 39.2 | Solar Water heater | 41,320 kWh | 33.9 |
| 4. | Wood | 13.0 Tons | 23.6 | Trees | 1,769 | 38.6 |
| | | | | Bio Gas | 7,445 | 20.0 |
| **Total Emission** | | | **779.2** | **Total-Neutralized** | | **171.2** |
| **Balance $CO_2$ to be Neutralized = 608.0 Tons/Annum** | | | | | | |

### *3.3: Calculation Table:*

| |
|---|
| For Electricity = $\left[\text{kWh x } \frac{\text{0.82 kg of CO2 emission}}{\text{kWh}}\right]$ |
| For LPG = $\left[\text{LPG Consumption (kg)x } \frac{\text{3.0 kg of CO2 emission}}{\text{kg of LPG Consumption}}\right]$ |
| For Diesel = $\left[\text{Diesel Consumption (Litre)x } \frac{\text{2.64 kg of CO2 emission}}{\text{Litre of Fuel Consumption}}\right]$ |
| For Wood = [Wood Consumption (kg) x 1.9 kg of CO2 Consumption] |
| A mature tree is able to absorb nearly $CO_2$ at a rate of 21.8 kg/annum; $\frac{(21.8\ x\ 1{,}769)}{1{,}000} = 38.6\ \frac{\textbf{Tons}}{\textbf{Annum}}$ |

### *3.4: 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

### *3.5: 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.



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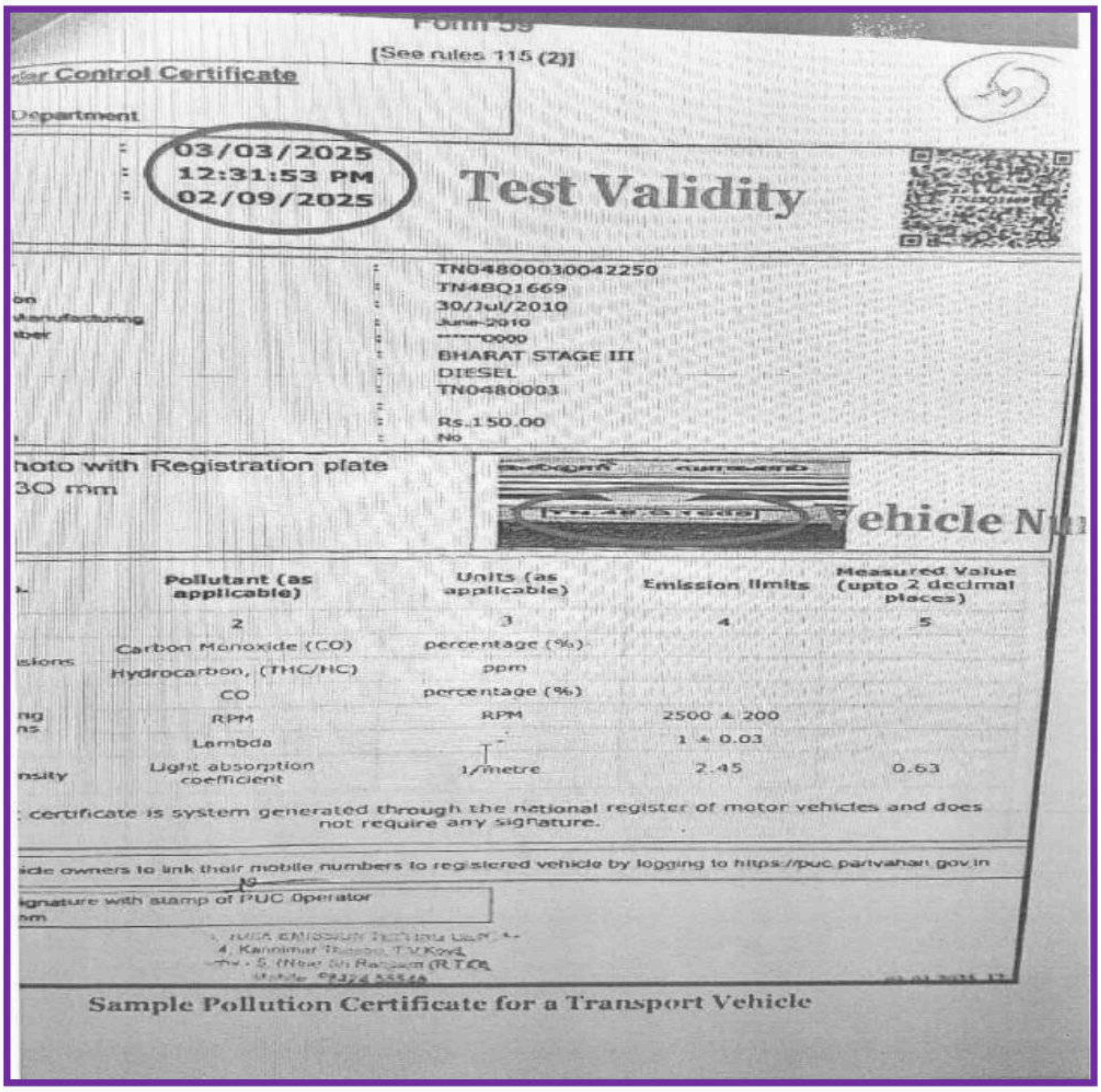
- **As per the Solar Policy-2019** from Government of Tamil Nadu; for any educational institutions have to implement substantiate a minimum of **6 % of its energy generation from renewable energy source**.
- Convert existing convention street lightings into solar based battery-operated lightings.
- Identify 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.

### ***3.6: 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-4.

**Table-4: 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 | 27 | Yes |
| **Total No. of Vehicles** | | | **27** | Yes |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3
4
5
Carbon Monoxide (CO)
percentage (%)
Hydrocarbon, (THC/HC)
ppm
CO
percentage (%)
RPM
RPM
2500 ± 200
Lambda
1 ± 0.03
Light absorption coefficient
1/metre
2.45
0.63
certificate is system generated through the national register of motor vehicles and does not require any signature.
side owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in
Signature with stamp of PUC Operator
Sample Pollution Certificate for a Transport Vehicle







***3.7: Roof Top Solar Photovoltaic System:***

- The college has installed solar PV plants with a capacity of **150 kW**, generate and utilized by the campus load.
- All the conductive parts are properly earthed at respective buildings and ensures safety.
- Table-4 shows the Specifications of Roof Top Solar PV Plant.

**Table-5: Specifications of Roof Top Solar PV Plant**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Total Capacity (kWp) | | | | | **150 kW** | | | | |
| Panel Make/Model | | | | | TATA Power Solar / TP315LBZ | | | | |
| $P_{max}$ | 315 | $V_{max}$ | 37.00 | $I_{max}$ | 8.53 | $V_{oc}$ | 44.90 | $I_{sc}$ | 8.97 |
| Location of SPV Plant | | | | | CE Block Top & Girls Hostel Top | | | | |
| Availability of Tracking | | | | | No | | | | |
| No. of Panels per Inverter & No. of Panels | | | | | 125 & 345 | | | | |
| No. of Inverters & Power Rating | | | | | 3 Nos of 50 kW each | | | | |
| Make and Model. | | | | | GOODWE | | | | |
| Output Voltage and Frequency | | | | | 380 - 400/230 V, 3P-4W, 50 Hz | | | | |
| Synchronizing Point | | | | | MV Panel | | | | |
| Number of DC & Inverter Earthing | | | | | 4 Each | | | | |
| Panel Mounting Direction & Angle | | | | | 15° North-South; Fixed Orientation | | | | |
| Frequency of Panel Cleaning | | | | | 15 Days Once | | | | |
| Average Units Generated per Day | | | | | 675 kWh/day | | | | |




Energy saving from solar PV system (from the installation) is ***85,520 kWh*** which reduces **70.1 Tons of $CO_2$ Emission.**



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**Components of Roof Top Solar PV Plants**

## *3.8: Hot Water Generation using Solar Thermal System:*

- In order to promote more green generation; the management has installed Solar Thermal system in the staff quarter's roof top and generates hot waters for bathing application
- It is a good practice to use renewable energy-based system for hot water generation by avoiding conventional heating methods (electricity or wood based)
- The specifications of the existing solar thermal hot water system are shown in Table-6.

**Table-6: Specifications of the Solar Thermal Hot Water System**

| Description | 1,000 Litre x 4 Nos | 1,000 Litre x 4 Nos |
|---|---|---|
| Make and Model | Racold | Racold |
| Location | New Boys hostel | Old Boys hostel |
| Panel Orientation | North - South face | North - South face |



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| | | |
|---|---|---|
| Source of Water | Bore well | Bore well |
| Application | Bathing only | Bathing only |
| Total Capacity | **4,000** | **4,000** |

***Energy Calculation:***

| S. No | Description | Parameters |
|---|---|---|
| 1. | Assuming 80 % of the total capacity is being utilized | = (0.8 * 8,000)<br>= 6,400 Litres/Day |
| **2.** | Energy required to heat the water from ambient ($25^0$C) to maximum of $60^0$C (Normal bathing temperature) | **= m x $C_P$ x $\Delta t$**<br>= 6,400 x 1 x (60-25)<br>**= 1,59,940 kcal/Day** |
| **3.** | Considering 10 % cumulative losses in the electric heating element + electrical network; then energy input to the heater is given by, | $= \frac{1,59,940}{0.9}$<br>**= 1,77,711 kcal/day** |
| **4.** | Electrical energy required to heat up the same quantity of water for the same condition is given by; | $= \frac{1,77,711}{860}$<br>**= 206.6 kWh/Day** |
| **5.** | Approximately 200 days in a year then cumulative electrical energy (200*206.6) | **= 41,320 kWh/Day** |

### *3.9: Handling of Chemicals/Salts/Acids used in the Laboratories:*

The science departments & Department of S & H 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

### *3.10: 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.



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- 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










***3.11: 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 in the campus.

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

| S. No. | Cleaning Agent | Application |
|---|---|---|
| 1. | Sabena | Vessel Cleaning |
| 2. | Soap oil | Floor Cleaner |




**Cleaning & Refreshing Agents used for Vessel & Floor Cleaning**



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### *3.12: 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)**

### *3.13: 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 |
|---|---|---|
| Fresh Water | Product RO Plant | Drinking application |
| Bore Well | 1. Engineering Play Ground<br>2. Near Main Gate (Engg. Borewell)<br>3. Near Main Gate (Boys Hostel Borewell)<br>4. Main Gate<br>5. Near Boys Hostel<br>6. Mess Borewell<br>7. Girls Hostel Borewell (Boy + Girls Hostel)<br>8. Girls Hostel Borewell | Utensil Cleaning, Bathing, Cloth Washing & RO Plant |
| Open Well | Open well | Gardening |
| Rain Water Harvesting System (RWHS) | Two individual pond is used to store rain water | ↗ Used to increase the ground water<br>↗ To store building run-off only |

### *3.14: 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.



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**Table-9: Details of the Water Utilities, Storage and Motor Capacity**

| S. No. | Location | Depth | Motor Capacity | Storage - I | Motor Capacity | Usage |
|---|---|---|---|---|---|---|
| **BOREWELL WATER** | | | | | | |
| 1. | Near Main Gate (Boys Hostel Bore well) + Near Boys Hostel + Mess Bore well + Girls Hostel Bore well (Boys & Girls) | 210 ft + 110 ft + 270 ft + 90 ft | 5 HP /3.7 kW + 1 HP /0.75 kW + 3 HP / 2.2 kw + 5 HP /3.7 kW | Boys Hostel Sump (RCC Tank) 40,000 Litre | 7.5 HP / 5.5 kW | New Boys Hostel (RCC Tank) 45,000 Litre |
| | | | | | | Old Boys Hostel (Sintex Tank) 9 x 5,000 Litre |
| 2. | Engineering Play Ground + Near Main Gate (Engg. College) | 240 ft + 270 ft | 5 HP/ 3.7 kW + 5 HP/ 3.7 kW | Main Block Sump (RCC Tank) 25,000 Litre | 7.5 HP / 5.5 kW | KRCE Block (Sintex Tank) 4 x 5,000 Litre |
| 3. | Girls Hostel Bore well (Boys & Girls) + Girls Hostel Bore well | 90 ft + 230 ft | 5 HP/ 3.7 kW + 5 HP/ 3.7 kW | Girls Hostel Sump (RCC Tank) 40,000 Litre | 7.5 HP / 5.5 kW | New Girls Hostel (Sintex Tank) 8 x 5,000 Litre |
| | | | | | | Old Girls Hostel (RCC Tank) 40,000 Litre |

| S. No. | Source of Water | R.O Plant Location | Storage | Waste Water Usage |
|---|---|---|---|---|
| **DRINKING WATER (R.O PLANT)** | | | | |
| 5. | Old Boys Hostel Sintex Tank | Boys Hostel Ground Floor | 2,000 Litre (Sintex Tank) | Return Back to Boys Hostel Sump |
| 6. | Old Boys Hostel Sintex Tank | Hostel Mess | 500 Litre (Sintex Tank) | Vessel Washing |
| 7. | New Girls Hostel Sintex Tank | Girls Hostel Ground Floor | 5,000 Litre (Sintex Tank) | Cloth Washing |
| 8. | College of Engineering Sintex Tank | College of Engineering Block Top | 5,000 Litre (Sintex Tank) | Staffs Hand Wash |



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**Note:**

- ☞ For Raw water Over Head (OH) tanks are made using cement construction and also Sintex Tanks.
- ☞ For R.O water stored only Sintex Tanks.
- ☞ The maintenance team ensure to clean the tank for six months once.
- ☞ Bleaching power is mostly used to clean the inside tank.

## ***3.15: Treated Water for Drinking Application:***

- The college management is keen on providing uninterrupted, safe and healthy drinking water to all; throughout the year.
- Water Taps are provided at appropriate places offering the treated water for the students.
- 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.




**PVC and Metal Based Taping System for Water Distribution Line**



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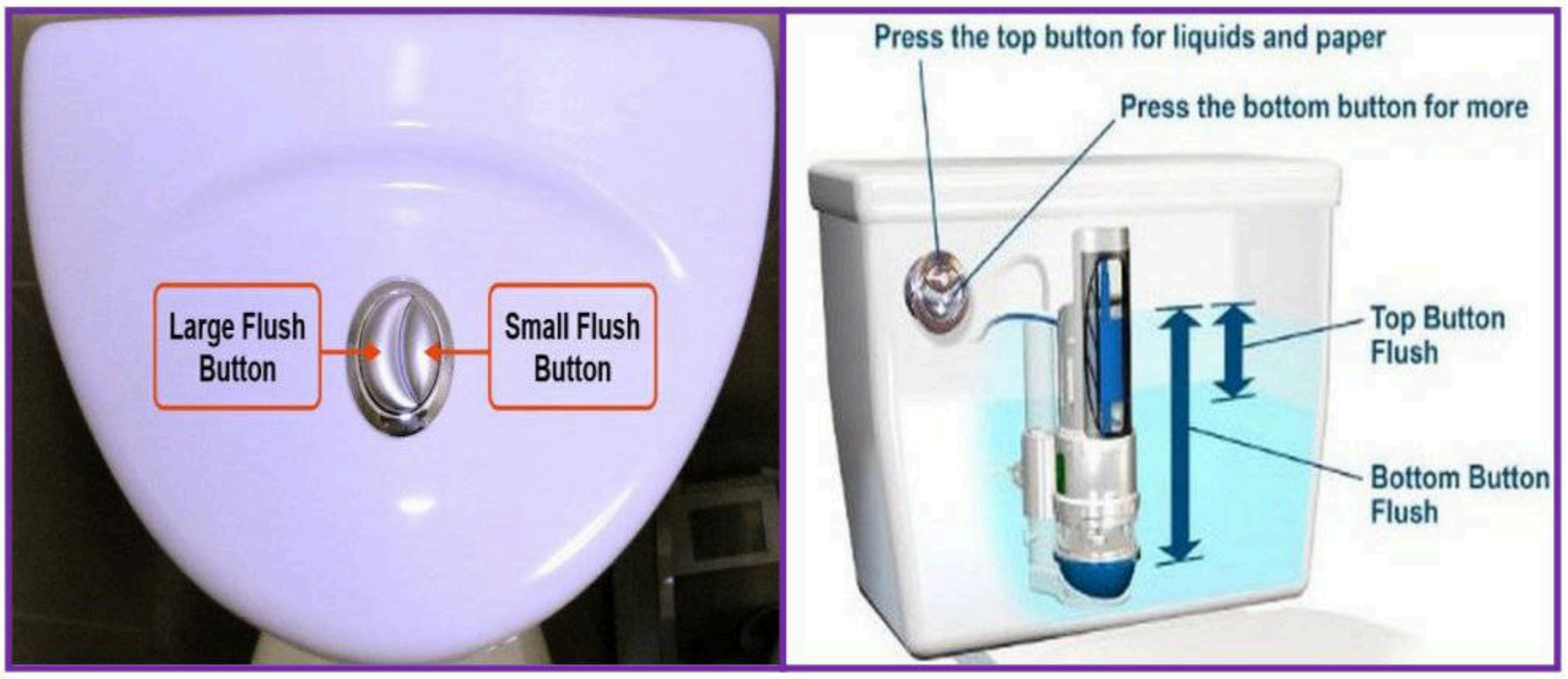
## *3.16: Water Savings in Foreign Toilets:*

- 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. | Ground Floor | 5 | 3 |
| 2. | I$^{st}$ Floor | 25 | 4 |
| 3. | II$^{nd}$ Floor | 24 | 6 |
| 4. | III$^{rd}$ Floor | 23 | 5 |
| 5. | IV$^{th}$ Floor | 6 | 1 |
| 6. | V$^{th}$ Floor | 12 | 2 |
| **Total** | | **95** | **21** |

- 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.




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

- The audit team appreciates the effects taken by the management of **K. RAMAKRISHNAN COLLEGE OF ENGINEERING (Autonomous)** for harvesting the rain water in separate pond available back side of the college.
- The roof area is so arranged to collect the rainwater and then passed through proper piping system, and then bring back to the open pond which are located inside the college next to the Vehicle Parking.
- The building run off and Common area and road run-off are properly collected and routed to nearby water body.



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Size of the Pit
L = 100 Ft
B = 100 ft
D = 20 ft
Open area is used as stored runoff water


Size of the Pit
L = 300 Ft
B = 15 ft
D = 20 ft
Open area is used as stored runoff water


Open well is water is used to gardening



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### ***3.18: 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.




**Sample Name Board in front a Rain Water Harvesting System**

### ***3.19: 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.



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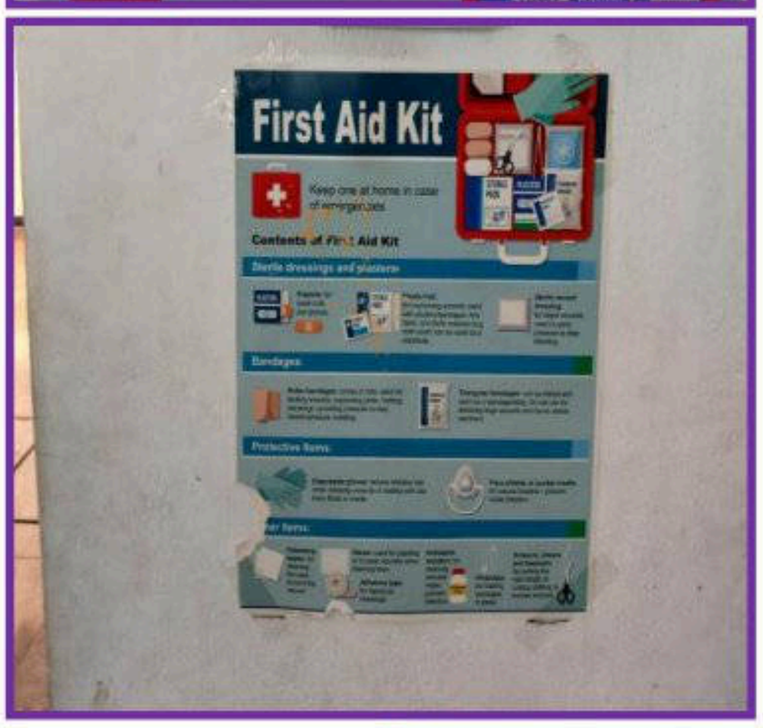
## ***3.20: Installation on Fire extinguishers:***

- 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)















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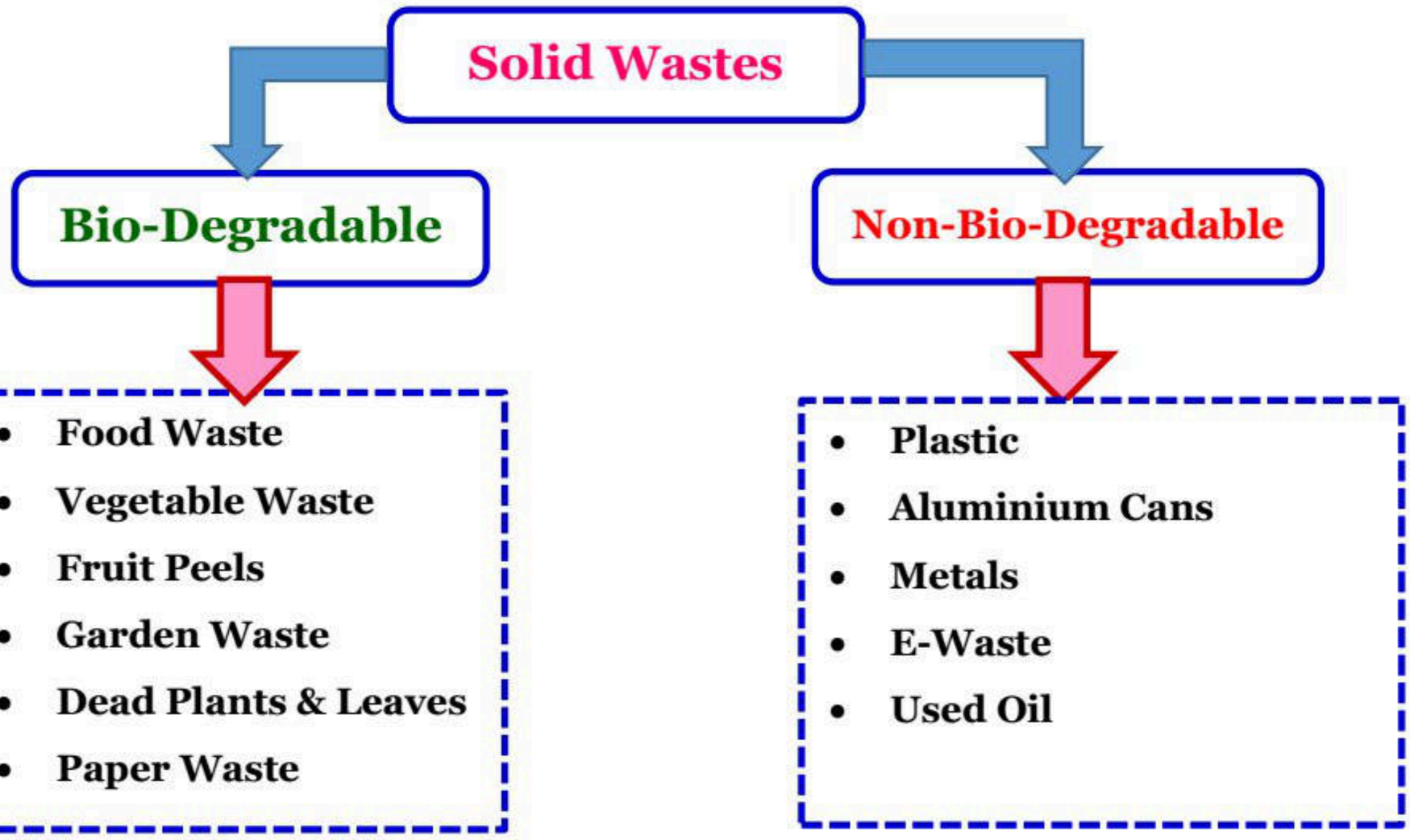
### *3.21: Solid Waste Management System:*

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




### *3.22: 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 | • Used to Bio Gas Plant |
| 2. | Garden Wastes and Plant Leaves | • Daily collected and dumped in separate place |
| 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).**<br>• The chemical/salt storage containers are disposed to third party |
| 5. | Construction Waste | • Mostly used by their own construction and used for internal land filling |
| 6. | Metals | • Construction metals or metals from any other sources are stored & sale to third party for recycling |
| 7. | Transport Oil + Tyres | • Stored in separate place and soled to 3rd party |
| 8. | DG Engine oil & Coolant | • Stored in separate place and soled to 3rd party |



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| | | |
|---|---|---|
| 9. | Vehicle & Computer Batteries | • Procuring new batteries with buyback offer<br>• (Old battery replacement) |
| 10. | Used edible oil | • Stored Separately and sold to third party. |
| 11. | E-Waste Management | • Stord in separate place. |

### ***3.23: 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)

### ***3.24: 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)









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



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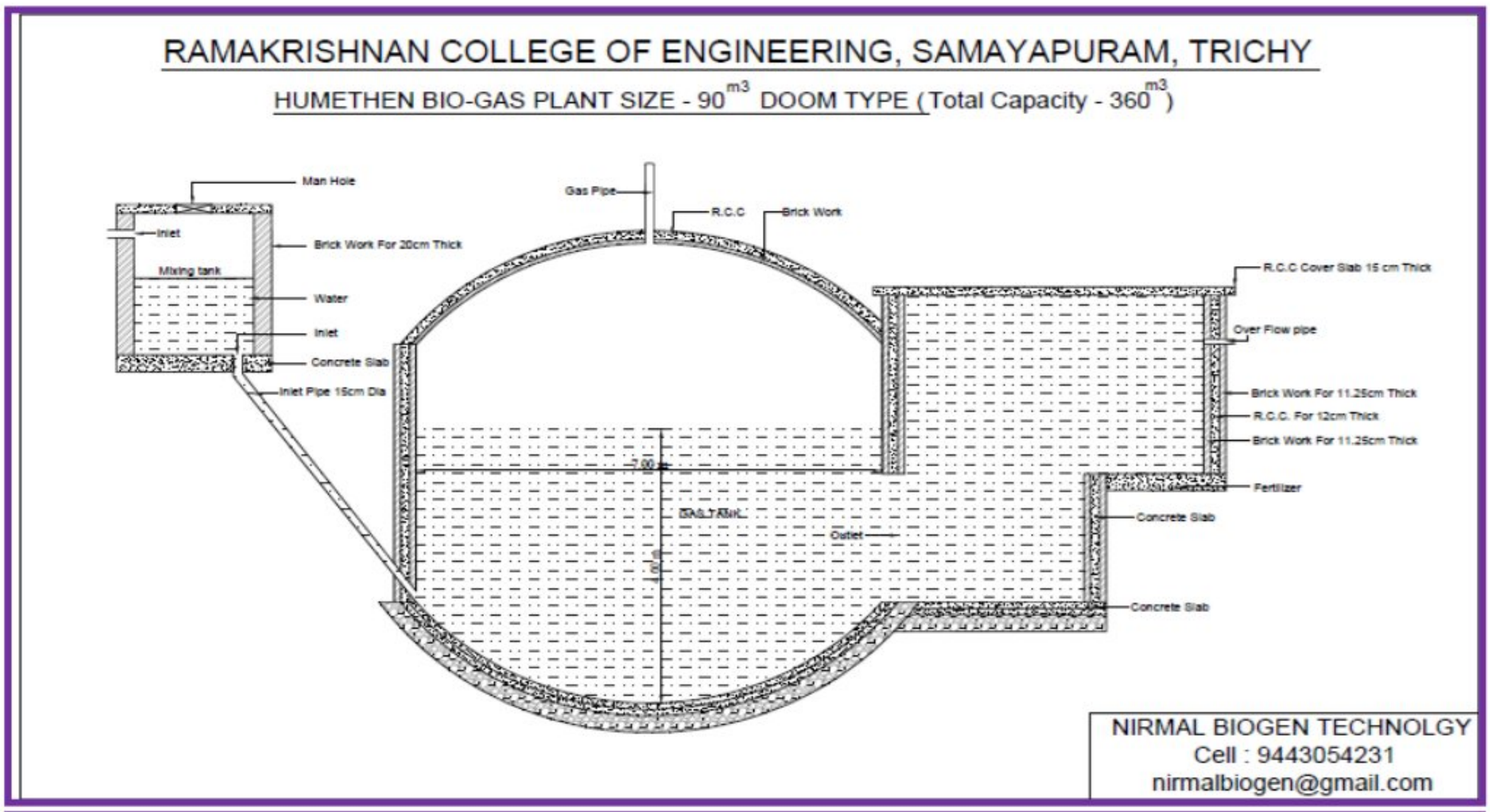
## ***3.25: E-Waste Management:***

- ⊕ With the proliferation of electronics also comes the challenge of their proper disposal. The institute has very efficient mechanism to dispose E wastes generated from various sources.
- ⊕ The major e-waste such as written-off instruments/equipment, old version computers, printers, electronic gadgets/circuits, kits have been written off on regular basis and condemned devices and materials from computer lab are sold to the e-waste management companies/buyers in Coimbatore.
- ⊕ All the miscellaneous e-waste such as CDs, batteries, fluorescent bulbs, PCBs, and electronic items are collected and delivered for safe disposal. Minor repairs are addressed by the lab technician with the support of staff members whereas the major issues are repaired by professionally trained personnel.

## ***3.26: Bio-Gas Plant:***





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| Specifications | |
|---|---|
| Plant Size | 90 $m^3$ |
| Cooking Gas | 1. Two No's of Dosa maker<br>2. 8 Single Stove Connected<br>(3 x 90 kg Produced / Day) |



**Dosa Maker connected to Biogas plant**




**Separate stove connected to Biogas plant**



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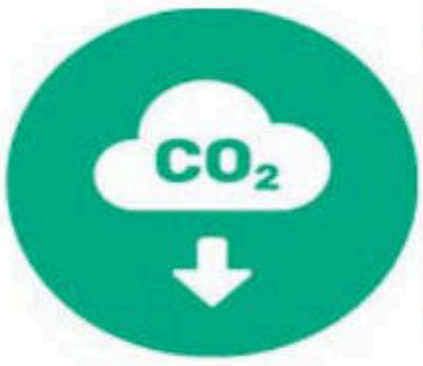
## *3.27: Campus Greenery:*

The college is completely covered with mature trees grown for more than 20 years. The total number of mature trees available in the college campus is ***1,769 with many varieties of trees.***

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

| S. No. | Location | Name of the Tree | Quantity |
|---|---|---|---|
| 1.0 | Entire Campus Location | Variety of Mature Trees | **1,769** |




Total No. of Mature Trees available in the college campus is **1,769** which contributes for reduction of **38.6 Tons of $CO_2$ emission/Annum**





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### ***3.28: 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.



### ***3.29: 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.

### ***3.30: 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

**K. RAMAKRISHNAN COLLEGE OF ENGINEERING**

NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112.

# 4. RECOMMENDATIONS






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***4.1: RECOMMENDATIONS:***

- Prepare a schedule to clean the air filters of AC indoor units at regular intervals
- Measure the earth resistance at regular interval and maintain within the standard.
- Voltage drops at the load end can be improved by load end capacitors compensation
- Battery voltage of each UPS must be measured and monitored.
- Prepare and adhere a cleaning schedule for UPS
- Conduct awareness programmes on Energy Conservation to all the stake holders.
- Foot valve of all the submersible and open well pipes must be cleaned at regular intervals and this ensure i) free flow of water and ii) reduced power consumption.
- Connect load end compensation capacitors to reduce the cable distribution loss.
- Set the air conditioning area temperature within a range of 24-26 $^{0}$C to have better human comfort and hence to save power.
- Provide electronic energy meters and run-hour meters for each pump.

**Audit Conducted and Verified by,**




**Dr. S.R. SIVARASU**

**BEE Certified Energy Auditor (EA-27299)**

**Lead Auditor – ISO 14001: EMS; IGBC AP, GRIHA CP**

**CII Certified Professional in SWM**

**ISO-14064: Implementor & Auditor - Carbon Footprint Management**


# COMPLETION OF THE REPORT

This report is prepared as a part of the Energy, Environment and Green Audit process conducted **K. RAMAKRISHNAN COLLEGE OF ENGINEERING (AUTONOMOUS),** NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112 by **RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING,** Coimbatore – 641 062.



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# ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

**K. RAMAKRISHNAN COLLEGE OF ENGINEERING**

NH 45, Samayapuram, Tiruchirappalli, Tamil Nadu – 621 112.

## *ANNEXURE:*

## AUTHORISED CERTIFICATES OF THE AUDITOR



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ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ CERTIFICADO ◆ СЕРТИФИКАТ ◆ CERTIFICAT

South Asia

# CERTIFICATE

**The Certification Body**
**of TÜV SÜD South Asia Private Limited**

certifies that

**M/S RAMKALAM CENTRE FOR ENERGY CONSULTANCY & TRAINING**
**No.8, VPK Garden, Velanaipatti, Coimbatore – 641 062, India**

has implemented Quality Management System

in accordance with **ISO 9001:2015**

for the scope of

**Providing Energy, Environment, Green audits to industry, Academic institutions and organizations**

The certificate is valid from **2023-11-22** until **2026-11-21**

Subject to successful completion of annual periodic audits

The present status of this certificate can be obtained through TUV SUD website by scanning below QR code and by entering the certificate number (without spaces) on web page. Further clarifications regarding the status & scope of this certificate may be obtained by consulting the certification body at info.in@tuvsud.com

Certificate Registration No. **99 100 23573**

Date of Initial certification: **2023-11-22**

Issue Date: **2023-11-22** Rev. **00**

Rahul Kale
Head of Certification Body
of TÜV SÜD South Asia Private Limited,
**Mumbai**
Member of TÜV SÜD Group

QM011

TÜV SÜD South Asia Pvt. Ltd. ● TÜV SÜD House ● Saki Naka ● Andheri (East) ● Mumbai – 400072 ● Maharashtra ● India



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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



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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

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

010920211006

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